JOHN BANKS & SON LTD.,

BRASSFOUNDERS, ENGINEERS

COPPERSMITHS

SHEET LEAD & LEAD PIPE MAKERS

Not in Ferguson

[188-?]

See page 217 - 1886

Awarded First Prizes

PARIS, PHILADELPHIA, AMSTERDAM, CALCUTTA, MELBOURNE, SYDNEY, AND CHRISTCHURCH.

Works Founded in 1859.

JOHN DANKS & SON

PROPRIETARY

LIMITED.

Descriptive Catalogue

WINDMILLS, HORSE WORKS,
Centrifugal, Lift and Force, Boiler Testing, Chain and Garden Pumps,
ENGINES, THRASHERS
Engineers' Brass Work,
WROUGHT AND CAST IRON PIPES.

391 Bourke Street,

Melbourne.

In issuing this, our Catalogue of some of the lines manufactured and sold by us, we wish our clients to note that we are not only able to supply the goods specified, but any goods of a like kind, and, as heretofore, we are only too pleased to manufacture anything in our lines to the special design of Architects, Builders, and the trade generally. Our works in England and the Colony are among the largest of the class, enabling us to turn out goods in quantity and quality not to be excelled. While advertising our wares and manufactures, we have also tried to make our Catalogue a hand-book of information on most matters connected with our trade; and should such information be insufficient, we will be only too pleased to reply to any letters. We sincerely thank our clients for the cordial support we have hitherto received, and assure them that we intend to spare no effort to further deserve their patronage.

Yours, etc.,

JOHN DANKS & SON LIMITED.

JOHN DANKS & SON LIMITED

ILLUSTRATED CATALOGUE.

PUMPS.

OUR long experience has taught us that pumps, so little understood by many people, should be so constructed that the principle on which they work may be easily understood after one intelligent explanation. The action of the pump is as follows :—After a few strokes of the pump-handle the air in the suction-pipe is exhausted, creating a vacuum, and then as the water is pressed by the outward air, equal to 15 lb. on the square inch, the water rises into the barrel *as fast as the piston rises;* the water will remain in the suction-pipe as long as the piston and valves are in working order.

In fixing the pipes to a pump great care should be exercised to have all joints absolutely air-tight. The suction pipes should be at least half the area of pump cylinder; avoid bends as much as possible, as they offer considerable resistance to flow of water. We never recommend lifting water by an ordinary lift pump over 25 feet; for wells exceeding that depth we recommend the force and lift pump. The suction pipe of a force and lift pump should not be more than 20 feet long, but the delivery pipe may be any length provided the necessary power is available. The following tables will no doubt be of great use to our clients in ordering pumps and tanks. We will be pleased to supply any further information required.

USEFUL MEMORANDA FOR HYDRAULIC CALCULATIONS.

1 cubic foot of water = 62·425 lbs. = ·557 cwt. = ·028 ton.
1 cubic inch „ = ·03612 lb.
1 gallon „ = 10 lbs. = ·16 cube feet.
1 cube foot of water = 6·24 gallons = say 6¼ gallons.
1 cwt. of water = 1·8 cube foot = 11·2 gallons.
Water, weight per cylindrical foot, 49·10lbs.
Water, capacity of cylinder 1 foot diameter by 1 foot long, 4·895 gallons.
Cylindrical feet multiplied by 4·895 = imperial gallons.
Imperial gallons multiplied by ·16045949 = cubic feet.
1 gallon water = 0·16 cubic foot. | 1 ton water = 36·0 cubic feet.
1 cwt. „ = 1·8 „ | 224 gallons „ = 1 ton.

SEA WATER.

1 cube foot of sea water = 64·11 lbs.
Weight of sea water = 1·027 weight of fresh water.

PRESSURE.

Each atmosphere, or 14·706 lbs. per square inch = 33·9 feet of water.
Each lb. per square inch = 27·68 inches of water.

Showing the Quantity of Water per Lineal Foot in Pumps or Vertical Pipes of different Diameters.

Diameter of pump in inches.	Number of gallons per lineal ft.	Number of cubic feet per lineal ft.	Diameter of pump in inches.	Number of gallons per lineal ft.	Number of cubic feet per lineal ft.
2	·136	·0218	8	2·176	·3490
2¼	·172	·0276	8¼	2·314	·3712
2½	·212	·0340	8½	2·456	·3940
2¾	·257	·0412	8¾	2·603	·4175
3	·306	·0490	9	2·754	·4417
3¼	·359	·0576	9¼	2·909	·4066
3½	·416	·0668	9½	3·068	·4923
3¾	·478	·0766	9¾	3·232	·5184
4	·544	·0872	10	3·400	·5454
4¼	·614	·0985	10¼	3·572	·5730
4½	·688	·1104	10½	3·748	·6013
4¾	·767	·1230	10¾	3·929	·6302
5	·850	·1363	11	4·114	·6599
5¼	·937	·1503	11¼	4·303	·6902
5½	1·028	·1649	11½	4·496	·7212
5¾	1·124	·1803	11¾	4·694	·7529
6	1·224	·1963	12	4·896	·7853
6¼	1·328	·2130	12½	5·312	·8521
6½	1·436	·2304	13	5·746	·9217
6¾	1·549	·2489	13½	6·196	·9939
7	1·666	·2672	14	6·664	1·0689
7¼	1·787	·2866	15	7·650	1·2271
7½	1·912	·3067	16	8·704	1·3962
7¾	2·042	·3275	18	11·016	1·7670

Examples of the Utility of the above Table.

1. Required the quantity of water lifted by each stroke of the bucket of a 9½-inch pump, the length of stroke being 2¼ feet.

$$3{\cdot}068 \times 2{\cdot}25 = 6{\cdot}903 \text{ gallons each stroke.}$$

2. What length of stroke with a 6-inch pump will be necessary to discharge 44 gallons of water per minute, the number of strokes being 18 in the given time?

$$\frac{44}{1{\cdot}224 \times 18} = 2 \text{ feet, the length of stroke.}$$

Table showing the quantity of Water discharged per minute by Single, Double, and Treble Barrel Pumps, at various speeds, exclusive of Slip.

Diameter of Pump.	Length of Stroke.	Single Barrel.		Double Barrel.		Treble Barrel.	
		30 Strokes per Minute.	40 Strokes per Minute.	30 Strokes per Minute.	40 Strokes per Minute.	30 Strokes per Minute.	40 Strokes per Minute.
Inches.	Inches.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.
1½	9	1¾	2¼	3½	4½	4½	6¾
2	9	3	4	6	8	9	12
2½	9	4¾	6¼	9½	12	14	19
3	9	6¾	9	13¼	18	20	27
3½	9	9¼	12½	18¾	25	28	37
4	9	12¼	16	24½	32	36	48
4½	9	15½	20¾	32	42	46	62
5	9	19	25½	38	50	57	76
5½	9	23¼	32	46½	62	69	92
6	9	27½	37	55	73	82	110
2	10	3½	4½	6	9	10	13
2½	10	5¼	7	10	14	15	22
3	10	7½	10	15	20	22	30
3½	10	10½	13¾	20	27	32	42
4	10	13½	18	27	36	40	54
4½	10	17	23	34	45	52	68
5	10	22	28	42	56	63	84
5½	10	25½	34	51	68	77	102
6	10	30½	40	62	82	92	122
2	12	4	5	8	10	12	16
2½	12	6¼	8	12	17	19	25
3	12	9	12	18	24	27	36
3½	12	12½	16	24	33	37	50
4	12	16¼	22	32	43	49	65
4½	12	20½	27	42	55	62	82
5	12	25¼	33	50	68	76	100
5½	12	30¾	42	62	82	92	123
6	12	36½	49	73	97	110	146
6½	12	43	57	86	114	129	172
7	12	50	66	100	134	149	199
7½	12	57	76	114	152	171	229
8	12	65	87	130	174	195	262
9	12	82	110	165	220	246	330
10	12	102	134	202	268	303	404
12	12	146	195	294	390	440	588

Surface of Tubes 1 Foot Long, in Decimal Parts of a Square Foot.

Bore.	Surface.	Bore.	Surface.	Bore.	Surface.	Bore.	Surface.
⅝	·1636	1⅛	·2945	1⅝	·4253	2¼	·5894
¾	·1963	1¼	·3270	1¾	·4580	2½	·6540
⅞	·2291	1⅜	·3599	1⅞	·4906	2¾	·7194
1	·2618	1½	·3927	2	·5233	3	·7859

Table Containing the Weight of Columns of Water, each 1 Foot in Length and of various Diameters, in lbs.

(avoirdupois.)

Diameter in inches.	Weight in lbs.	Diameter in inches.	Weight in lbs.	Diameter in inches.	Weight in lbs.
1	·3410	3	3·069	9	27·621
1¼	·5328	3½	4·177	10	34·100
1½	·7672	4	5·456	11	41·261
1¾	1·044	5	8·525	12	49·104
2	1·364	6	12·276	18	110·484
2¼	1·726	7	16·709	24	196·416
2½	2·131	8	21·824	36	441·936
2¾	2·678				

Table of Hollow Cast Iron Columns,

showing weight sustained by columns of different diameters and lengths.

Thickness of metal = ½ inch.

External Diameter in inches.	Length in feet.								
	6	8	10	12	14	16	18	20	25
	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.	tons.
3	5·8	4·0	3·2	2·3	1·8	1·4	1·2	1·0	·7
3½	8·2	5·9	5·1	3·6	2·7	2·3	1·9	1·5	·9
4	10·9	8·1	6·1	4·7	3·6	3·4	2·8	2·0	1·5
4½	13·8	10·6	8·1	6·5	5·0	4·4	3·9	3·1	2·0
5	16·8	13·3	10·4	8·3	6·7	5·4	5·0	4·0	2·7
5½	19·8	15·3	12·9	10·5	8·5	7·0	6·2	5·2	3·5
6	22·9	19·0	15·5	12·7	9·5	8·7	7·3	6·2	4·3
6½	26·0	22·0	18·3	15·2	12·4	10·7	9·1	7·7	5·4
7	29·1	25·0	21·2	17·9	15·1	12·8	10·9	9·3	6·5
7½	32·2	28·1	24·2	20·6	17·6	15·0	12·9	11·1	7·9
8	35·3	31·2	27·1	23·4	20·2	17·4	15·0	13·1	9·4
8½	38·4	34·3	30·2	26·3	22·9	19·9	17·3	15·1	11·0
9	41·4	37·4	33·3	29·4	25·6	22·5	19·7	17·4	12·7
	Thickness of metal = ⅝ inch.								
3	6·9	4·7	3·5	2·6	2·0	1·6	1·3	1·0	·8
3½	9·9	7·1	5·3	4·2	3·2	2·5	2·1	1·8	1·2
4	13·2	9·2	7·3	5·6	4·4	3·9	3·2	2·7	1·8
4½	16·7	12·8	9·9	7·7	6·1	5·5	4·5	3·8	2·6
5	20·4	16·1	12·7	9·1	8·1	7·0	6·0	4·9	3·5
5½	24·1	18·7	15·7	12·8	10·4	8·8	7·5	6·3	4·7
6	28·0	23·2	19·0	15·6	12·8	10·6	9·0	7·6	5·8
6½	31·8	26·9	22·4	18·7	15·2	13·0	11·0	9·4	7·6
7	35·6	30·7	26·0	21·9	18·5	15·6	13·3	11·4	9·0
7½	40·5	34·5	29·7	25·3	21·6	18·4	15·8	13·6	11·0
8	43·4	38·4	33·4	28·8	24·8	21·4	18·5	16·1	13·0
8½	47·0	42·2	37·1	32·4	28·2	24·5	21·3	18·6	15·5
9	51·6	46·1	41·0	36·2	31·5	27·7	24·3	21·3	18·1

Diameter, etc., of Circles, Contents in Gallons, Area in Feet.

Dia.	Circ.	Area in feet.	Gallons. 1ft. in depth.	Dia.	Circ.	Area in feet	Gallons. 1ft. in depth.
ft. in.	ft. in.			ft. in.	ft. in.		
1 0	3 1⅝	·7854	5·8735	3 0	9 5	7·0686	52·8618
1 1	3 4⅝	·9217	6·8928	3 3	10 2½	8 2957	62·0386
1 2	3 8	1·0690	7·9944	3 6	10 11⅞	9·6211	73·1504
1 3	3 11	1·2271	9·1765	3 9	11 9⅜	11·0446	82·5959
1 4	4 2⅛	1·3962	10·4413	4 0	12 6¼	12·5664	93·9754
1 5	4 5⅜	1·5761	11·7866	4 3	13 4⅛	14·1862	103·0300
1 6	4 8½	1·7671	13·2150	4 6	14 1⅝	15·9043	118·9386
1 7	4 11⅝	1·9689	14·7241	4 9	14 11	17·7205	132·5209
1 8	5 2¾	2·1816	16·3148	4 11	15 5¼	18·9858	142·0582
1 9	5 5⅞	2·4052	17·9870	5 0	15 8½	19·6350	146·8384
1 10	5 9	2·6398	19·7414	5 3	16 5¾	21·6475	161·8886
1 11	6 2¼	2·8852	21·4830	5 6	17 3¼	23·7583	177·6740
2 0	6 3⅜	3·1416	23·4940	6 3	19 4½	29·0867	223·9472
2 1	6 6½	3·4087	25·4916	7 0	21 11⅞	38·4846	287·8032
2 2	6 9⅜	3·6869	27·5720	8 0	25 1½	50·2658	375·9062
2 3	7 0¼	3·9760	29 7340	9 0	28 3¼	63·6174	475·7563
2 4	7 3⅞	4·2760	32·6976	10 0	31 5	78·5400	587·3534
2 5	7 7	4·5869	34·3027	11 0	34 6⅝	95·0334	710·6977
2 6	7 10¼	4·9087	36·7092	12 0	37 8⅜	113·0976	848·1890
2 7	8 1⅜	5·2413	39·1694	13 0	40 10	132·7326	992·6274
2 8	8 4½	5·5850	41·7668	14 0	43 11¾	153·9384	1151·2129
2 9	8 7⅝	5·9395	44·4179	15 0	47 1½	176·7150	1821·5454
2 10	8 10¾	6·3049	47·1505	16 0	50 3⅛	201·0624	1503·6250
2 11	9 1⅞	6·6813	49·9654	17 0	53 4⅞	226·9806	1697·4516
				18 0	56 6½	254·4696	1903·0254

Garden Syringe,

With Suction Hose and Strainer.

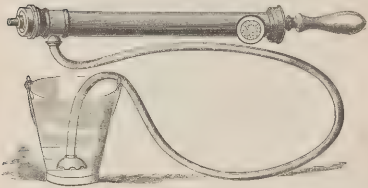


Fig. 2A.

Garden Syringes.

Fig. 1.

Fig. 2.

We have a large stock of these useful articles on hand. Their uses are too well known to require further comment.

Sizes, $\frac{3}{4}$, $\frac{7}{8}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.

Hand Garden Aquapult.

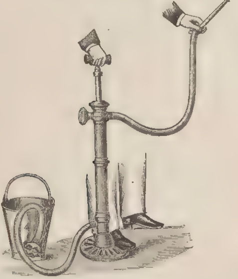
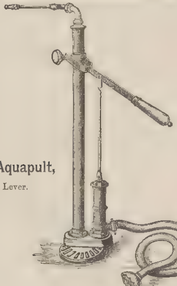


Fig. 3.

The Aquapult, or portable hand force-pump, is a new and valuable article, will throw about eight gallons per minute. The various uses of this pump are obvious. It is extremely useful for washing windows, etc This pump is constructed especially to meet the requirements of farmers, fruit growers, and florists, who find it absolutely necessary to spray trees and plants, to destroy worms and insects. (See also Fig. 4, page 9.)



Garden Aquapult,

With Lever.

Fig. 4.

Bolt-Fastened Revolving Cistern Pump.

Fig. 5 (see next page) represents a very popular style of our Cistern Pump which has been known to the trade for about fifty years, and needs no explanation of its operations We insert the cut here to call attention to the very important improvement, being the manner of securing the cylinder to the base by means of the adjustable ears and two bolts. The old style, with ears cast on cylinder, was liable to be broken by screwing the cylinder down to its place, thus causing a total loss of the cylinder. By our adjustable ears the spout can be placed in any position. This pump has a brass valve seat, and is complete in every respect. Adapted for either iron or lead pipe.

SIZES.

No.	0, 2	inch bore,	3¾	inch stroke,	suitable for	¾	inch pipe.
No.	1, 2¼	,,	5	,,	,,	¾	,,
No.	2, 2½	,,	5	,,	,,	1	,,
No.	3, 2¾	,,	6¾	,,	,,	1¼	,,
No.	4, 3	,,	6¾	,,	,,	1¼	,,
No.	5, 3¼	,,	7½	,,	,,	1½	,,
No.	6, 3½	,,	7½	,,	,,	2	,,
No.	8, 4	,,	7½	,,	,,	2¼	,,
No.	10, 4½	,,	7½	,,	,,	2½	,,

Bolt-Fastened Revolving Cistern Pump.

(NEW STYLE, WITH ADJUSTABLE EARS.)

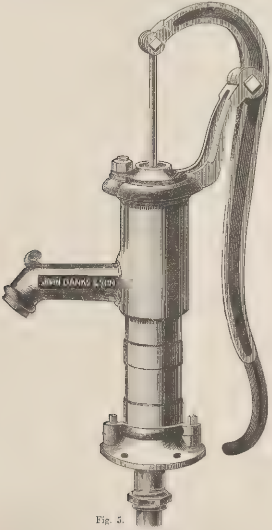


Fig. 5.

Bolt-Fastened Pitcher-Spout Pump.

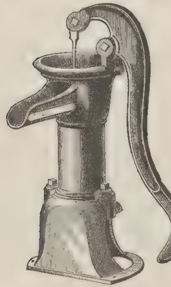


Fig. 6.

Fig. 6 is a cut of our BOLT-FASTENED PITCHER-SPOUT PUMP. This is a very simple and perfect pump, all parts being readily got at by the most inexperienced hands. Particularly adapted for CISTERNS and SHALLOW WELLS. For any height under say 20 feet, they will raise a greater quantity of water in a given length of time, with the same power applied, than any other style of pump in use. It has the *revolving top neatly arranged* on the *upper* end of *cylinder*, outside of the water passage, and cannot be affected by rust. It is arranged to let the water back to avoid freezing. The *lower valve seat* is of BRASS, arranged with suitable couplings for either *lead* or *iron* pipe. *This pump* is the *most popular* for use on the *Driven Well*, and the same as were furnished for the *English Army* in the *Abyssinian Expedition*, where they were used extensively, and gained great renown.

SIZES.

No. 1, $2\frac{1}{2}$	inch bore,	$4\frac{1}{2}$	inch stroke,	suitable for	$\frac{3}{4}$ inch pipe.
No. 2, 3	,,	$4\frac{1}{4}$	,,	,,	1 ,,
No. 3, $3\frac{1}{2}$	,,	4	,,	,,	$1\frac{1}{4}$,,
No. 4, 4	,,	$4\frac{1}{2}$	,,	,,	$1\frac{1}{2}$,,
No. 5, $4\frac{1}{2}$	,,	$4\frac{1}{2}$	,,	,,	2 ,,
No. 6, 5	,,	$4\frac{1}{2}$	,,	,,	$2\frac{1}{2}$,,

Improved Suction and Force Pump.

WITH AIR-BARREL (WITH PISTON ROD AND REVOLVING BRAKE STAND.)

Fig. 7 is our Improved Suction and Force Pump, arranged with air-barrel, making a very nice pump for throwing water through a hose, for fire purposes, washing windows, watering grounds, washing carriages, etc.

They will throw water some sixty or seventy feet from a hose pipe, making them valuable for every house for extinguishing fires, as they will throw a stream over any ordinary two-story house; they have a discharge coupling at the top, and also at the side of the air-barrel; there is a circular plate in the top coupling, which can be placed in the side coupling when the pipe is to go on at the top, or in the top coupling when the side discharge is to be used, constituting it an air-chamber or barrel, for either the top or side openings. This air-barrel serves to equalise and improve the working of the pump, whether used with hose for throwing water, or with metal pipes for forcing up water into tanks, reservoirs, or bathing rooms, etc. A goose neck may be screwed on to the side discharge, making it also a very nice Lift Pump for ordinary uses, and rendering this a very desirable pump for a great variety of purposes. We make six sizes of this style of pump.

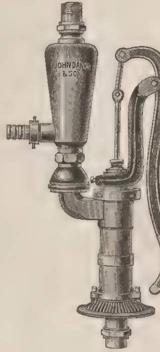


Fig. 7.

SIZES.

No. 0,	2 in. bore,	4 in. stroke,		suitable for	$\frac{3}{4}$	in. pipe.
No. 1,	$2\frac{1}{4}$,,	4	,,	,,	$\frac{3}{4}$	,,
No. 2,	$2\frac{1}{2}$,,	5	,,	,,	1	,,
No. 3,	$2\frac{3}{4}$ ..	$5\frac{1}{4}$	,	,,	$1\frac{1}{4}$	,,
No. 4,	3 ,,	$5\frac{1}{2}$	,,	,,	$1\frac{1}{2}$	,,
No. 6,	$3\frac{1}{2}$,,	$5\frac{1}{2}$	,,	,,	2	,,

Set-Length Force Pump, with Air-Chamber and Cock.

Fig. 8 shows our Set-Length Force-Pump, with Air-Chamber and Cock, adapted for deep wells, etc., with a Stop-Cock in Air-Chamber, as shown in Fig. 11.

A Very Cheap and Effective Plant.

SIZES.

No 2, 2¼ inch bore, with 3 feet 1¼ inch Set-length, 5 inch stroke.
No 3, 2¾ ,, ,, 1¼ ,, 5 ,,
No 4, 3 ,, ,, 1½ ,, 5 ,,

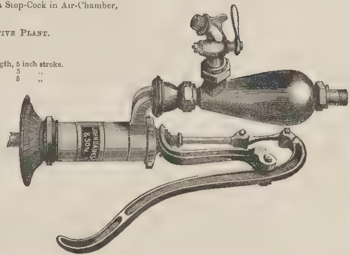


Fig. 8.

Working Barrel Pump.

Our illustration shows one of our Working Barrels (Fig. 9 or 10) fitted up in connection with pump pipe, rods, etc., and in use as a farmyard pump. This will give a clear idea as to the general fixing up of this class of pump, and will no doubt be of great aid to purchasers.

Working Barrels.

Fig. 9.

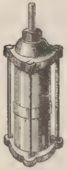


Fig. 10.

Fig. 11.

A Working Barrel is a cheap class of deep-well pump. It is less expensive than our brass pump, and within the reach of almost anyone. It is not nearly so good or so durable as the better class pumps, but in many cases is capable of doing really good work.

Side Suction and Force Pump.

Fig. 12 shows our SIDE SUCTION AND FORCE PUMP, with AIR-CHAMBER and COCK attached to same.

This is one of our cheapest Force and Lift Pumps, and has found much favour with small farmers, being very useful as a Fire Pump.

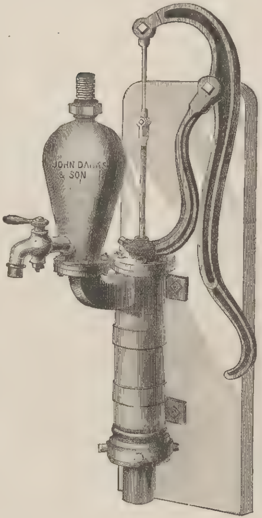


Fig. 12.

No 0, 2 inch bore, 4 inch stroke, suitable for ¾ inch pipe
No 1, 2¼ " 4 " " 1 "
No 2, 2¼ " 5 " " 1 "

No. 3, 2¾ inch bore, 5½ inch stroke, suitable for 1¼ inch pipe.
No. 4, 3 " 5½ " " 1½ "
No. 6, 3½ " 6½ " " 2 "

Suction and Force Pump.

(WITH BRASS PISTON ROD.)

MOUNTED ON PLANK WITH GUIDE ROD AND AIR BARREL.

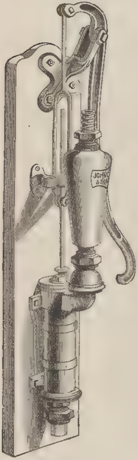


Fig. 13.

Fig. 13 is a cut of same kind and style of pump as Fig. 12 (and the various Nos. are of same capacity), with the addition of an Air Barrel, which renders the pump suitable for THROWING WATER in a JET through a hose and pipe for FIRE use, etc., and causes it also to WORK EASIER when used to force water to a great height than it does without the Air Barrel.

SIZES.

No. 2, $2\frac{1}{2}$ in. bore,		$5\frac{1}{2}$ in. stroke.	
No. 3, $2\frac{3}{4}$	,,	$6\frac{1}{2}$	,,
No. 4, 3	,,	7	,,
No. 5, $3\frac{1}{4}$	,,	$6\frac{1}{2}$	,,
No. 6, $3\frac{1}{2}$	,,	7	,,
No. 8, 4	,,	$7\frac{3}{4}$	,,
No. 10, $4\frac{1}{2}$	,,	$9\frac{1}{2}$	,,

Double-acting Suction and Force Pump.

Brass or Iron.

This *Cut* shows our Double-Acting Suction and Force Pump, *constructed* with the *valves all* in the *upper end* of cylinder, and easy of access for repair. It is a very steady and easy working pump, and admirably adapted for *power* as well as hand use; the piston is always immersed in water, so that the valves can never become dry; the pump will always bring water at first starting, as it is constantly charged with water. All sizes are made with the *Cap* on the side, held with one bolt and nut, as shown in the cut, so that the valves can be examined and repaired without disturbing the pipes.

Fig. 14.

Single Barrel Pump.

Fig. 15 shows our Suction and Force Pump, without Guide Rod, ready for setting, and as we send them out. It is readily seen by this that the cylinder may be placed down in a well within suction distance of the water, by welding out the rods, thus adapting it to very deep wells.

Fig. 15.

Fig. 16.

Single Barrel C Pump.

Our illustration at side shows our Single Barrel C Pump. As will be seen in the drawing, the face of the valve box is held in position by four bolts; these bolts are so fixed at the joint that they may be swung to one side when the nuts are partly unscrewed, so that one may take off the face without fear of losing any of the nuts. By removing the face of the valve box immediate access is gained to the valves, which may be examined and re-leathered without unscrewing any of the pipes or removing the pump. The pump buckets are also easily accessible by removing the cotter pin from the rod just above the pump, and unscrewing the pump cover. There is no pump of this class a greater favourite; the sales have become so considerable that there can scarcely be a district in the colony where one, at least, may not be found working. These pumps are also supplied double and treble barrel, with plank and handle, or frame and wheel as desired. This class of pump is specially adapted for windmill work, and is the best pump for that purpose We make a cheaper pump of this pattern with one bolt.

Single Pump Frame.

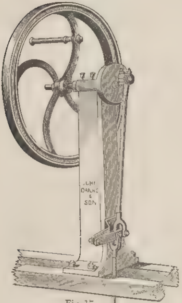


Fig. 17.

Fig. 17. This Pump Frame is useful for deep wells, and used with our C Pump (Fig. 16, shown above) makes a most effective pumping plant. Experience has taught us that this class of frame is the strongest, and is best adapted for colonial requirements when used with a single-barrel pump. For very deep wells, we advise the use of gear or toothed wheels, which allow a greater leverage, and of course make the work proportionately easier.

Single Barrel Pump on Frame.

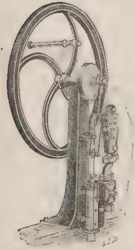


Fig. 18.

This pump, Fig. 18, which is one of the handiest and best we make for its purpose, is quite a general favourite. It is used by many of our up-country shire councils for pumping water from rivers and dams, to be carried away by water-carts. The extreme simplicity of construction, and the easy accessibility to the valves and working parts, make it exceedingly suitable for the work required of it. When required we supply a hose cock and a length of hose with this pump, in order that it may be used in case of fire or for washing buggies, etc. A stream of water may be sent forty feet from the nozzle of the hose, thus making it most effective in case of fire.

Double Barrel Pump and Frame, for Hand Power.

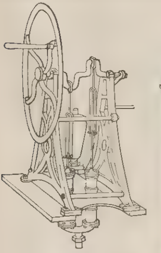


Fig. 19.

Fig. 20.

Figs. 19 and 20 represent our Double Barrel Pump and Frame, for hand-power. This is a very useful pump indeed for either deep or shallow wells (Fig. 20 being for the former and Fig. 19 for the latter) where a quantity of water is required to be pumped in a short time. In cases where the wells are very deep, and direct action is laborious, we provide gear or toothed wheels, so arranged as to lessen the speed and give a corresponding increase in the leverage, thus lessening the labour. The frame is principally built of cast iron, strongly bound together. The fly-wheel is large and weighty. The bearings of the best gun-metal, truly bored and finished. The cranks are of

wrought iron, and the crosshead and pump-rod of best gun-metal. Double Barrel Pumps of the C pattern (Fig. 16, page 18) may be used in conjunction with this frame, and are well worth the little extra expense, as the advantages pointed out in connection with that pump will show.

Double Crank,

With Fly-wheel, Handles, and Rods.

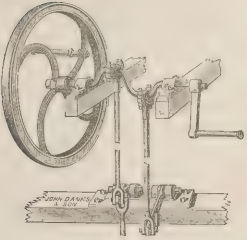


Fig. 21.

The above illustration represents our Double Crank, with fly-wheel, handles, and rods for deep well pumps. This is of course cheaper than the pump frame (Fig. 17), and in cases where money is a consideration, and a carpenter and timber are handy, this contrivance finds many admirers. Used in conjunction with our Double Barrel C Pump, it makes a most effective pumping plant.

When supplying orders for the above, we simply supply the metal portions named and shown, and no woodwork, unless specially ordered.

Double Barrel Pump,

With Horse Works.

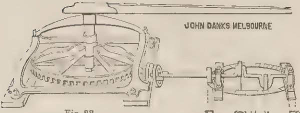
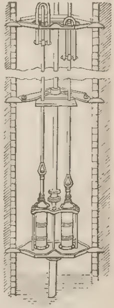


Fig. 22.



Our drawings show our celebrated Double Barrel Deep Well Pumps, with horse gear. These pumps are made in all sizes. They are working in all parts of the colonies, and are giving the greatest satisfaction. The horse works we now supply is stronger than that shown in our drawing; the crown wheel, instead of being ribbed or connected from outside to centre by spokes, is one solid casting; it is properly speeded so as to work the pump to the greatest possible advantage without knocking them to pieces. When desired by our customers, we send competent men to superintend the erection of our pumps, and we have at times sent our men many hundreds of miles from Melbourne on this errand.

Treble Barrel Deep-well Pump,

With Pulley, Fly-wheel and Gear.

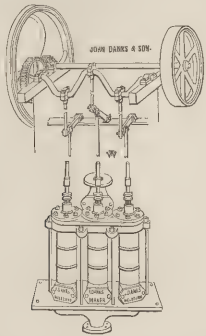


Fig. 23.

The above illustration is intended to show our Treble Barrel Deep-well Pump, with pulley, fly-wheel, and gear for steam power. This arrangement is very handy for those who have steam-power available, as in many cases our clients have; and as the same engine that drives the pumps may be used for chaff-cutting, cutting up wood, or for driving shearing machines, this arrangement is preferred by many. They are greatly used, and have found much favour with shire councils, graziers and others who have to pump their water from deep wells in large quantities. The pumps are made from the very best material, and the workmanship is guaranteed; the valves are of gun-metal, with good strong durable buckets, radius rods, and roller guides to prevent oscillation of the rods; the treble crank is properly turned and fitted; the fly-wheel is large and heavy, and the gear properly arranged as to speed. The whole arrangement when set up and working commands the greatest admiration: no jolting or jumping of rods, each barrel of pump performing its work with the utmost regularity and perfect ease, the result being a continuous, steady stream of water.

We supply this pump with treble frame and handles, as Fig. 19; with crank and fly-wheel, Fig 21; or with horse works, as Fig. 22.

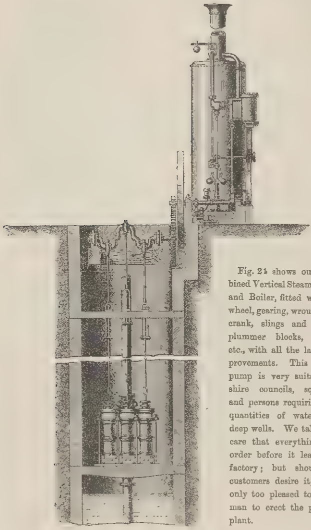


Fig. 24 shows our Combined Vertical Steam Engine and Boiler, fitted with fly-wheel, gearing, wrought iron crank, slings and guides, plummer blocks, brasses, etc., with all the latest improvements. This class of pump is very suitable for shire councils, squatters, and persons requiring large quantities of water from deep wells. We take every care that everything is in order before it leaves our factory; but should our customers desire it, we are only too pleased to send a man to erect the pumping plant.

Fig. 24.

Retaining Valves.

Our drawings show our different styles of Retaining Valves. These are extremely useful, and no pump should be fitted up without one. By their use the pump is always kept full of water. The leathers are always soft and good, and there is no necessity for priming the pump at all.

Fig. 25 open, to show Valve

Fig 25

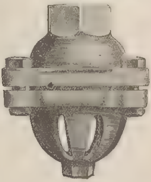


Fig. 26.

Strainers.

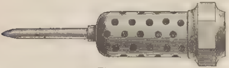


Fig. 27.

The drawing represents our Strainer, which is very useful in short lifts, where a retaining valve is not used. Its use may easily be seen; it is for keeping chips, stones, etc., out of the pump When required we cover this Strainer with fine brass gauge, so as to prevent seeds, sand, or anything of small size from being pumped up with the water.

Abyssinian Tube Wells.

The above fig. shows our Abyssinian Tube Wells in action. As to mode of fixing, etc., we are pleased to refer our customers to the following paper upon the subject.

On Abyssinian Tube Wells.

By Francis Corbett, Esq.

[Read before the Royal Society of Victoria, 13th July, 1874.]

These pumps were constructed of six lengths of ordinary iron gas piping, each of six feet long. Into one of these lengths was screwed a piece of solid iron, pointed, about eight inches long, and the shoulder next the pipe was made of a greater diameter than the pipe. This is for driving into the ground, and the diameter being greater than the pipe, it clears the way, especially where the holes are made in the pipe. Just above where this solid point is screwed, holes are drilled in the pipe for the water to enter, just as in any ordinary tubing for a well, for sixteen or eighteen inches in length. The number of these holes must of course be in proportion to the size of the pump, so as to admit as much water as the pump is capable of throwing. Less holes would be required in a small pump, suitable either for domestic purposes or for a small paddock. The pumps I got Mr. Danks to adapt the pipes for were No. 6 Douglas, the largest size made by that manufacturer. They are as large as can be reasonably worked by manual labour, and the larger the pump the better, as it takes the man less time to fill the troughs. Mr. Danks' arrangement for attaching the different lengths of the piping to one another is very good, as the pipes preserve their full strength. He has a ring or hoop about three inches broad, tapped from both ends, with right and left handed internal screws The ends of the pipes have screw threads worked on the outside of them, about an inch and quarter or inch and half long. The ring is screwed on to the first length of the pipe, and the second length is screwed into the ring, till the two ends of the pipes meet. By this connection the joints of the pipe become probably the strongest parts of it. The first length of the pipe, owing to the addition of the driving solid iron point, is nearly seven feet long. When this is driven into the ground, leaving only a few inches above the surface, the ring is screwed tightly on with a gasfitter's tongs. I may here mention that I would recommend that two of these tongs should be got, because in screwing the lengths of the pipe on tightly, the part driven into the ground will turn round if not held back. When the ring is screwed fully down, the next length of the pipe is screwed into the ring, and the driving is recommenced till the end of the second length is only five or six inches above the surface, and so the work of driving goes on. I may mention that Mr. Danks recommends that, when screwing in the different joints, the screws should be smeared with white lead. I have adopted his suggestion. In order to protect the top of the pipe as well as the driving block from injury by the blows in driving, Mr. Danks has fitted a cap which screws on to the ends of all the pipes, and offers a level surface to the monkey or block. He ingeniously devised the plan of having a little block of wood inside this cap. When the cap is screwed down tight, the wood presses on the top of the pipe, and at one and the same time prevents jar on the pipe, and prevents the screws being injured by stripping. Care should be taken never to omit putting this block in, nor screwing the cap well down on it, otherwise the cap may fasten on the top of the pipe and not screw off again, owing to the thread of the screws being injured. When one length is driven, the cap is taken off and screwed on to the top of the next length, after the latter is connected with that already in the ground.

Now as regards the driving. This can be managed by any handy man about a station, with the assistance of two labourers to haul up and down the monkey, etc. The apparatus may be of the rudest kind. My arrangements are as follows:—I took three pieces of quartering about eighteen feet long and 3″ x 3″. These were erected over the spot selected for the pump, so as to form a triangle to hold a double pulley block for hauling the driving block up and down on. For the driving block I used a piece of a gate post about nine inches square, and four or five feet

long. Through this a hole was bored a few inches from one end, and a rope about sixty feet long passed through this hole. Then either end of this rope is passed from opposite sides over each wheel, or sheaf of the pulley-block, so as to come down to the ground at opposite sides, where the men who are to lift the driving block stand. The log or driving block consequently hangs on the middle of the rope when the men pull, and can be lifted about fourteen or fifteen feet from the ground. It is of course necessary to provide for the guiding of the driving block, otherwise when let drop on the top of the pipe it would fall on one side. My arrangement for this guiding frame is two pieces of hardwood quartering, fourteen feet long, bolted at each end to two cross pieces of batten, so as to keep them about three inches apart. The lower ends of these are sunk a few inches in the ground to keep them steady, and the upper ends are fixed to the triangle just behind where the block hangs. On the back of the log or driving block, a piece of quartering three inches wide is spiked; this has two crosspieces of batten bolted to it, the piece of quartering passes up and down with the driving block in the opening between the sides or pillars of the guiding frame, thus keeping the driving block from falling laterally, and the pieces of batten at the back keep it from falling forward when the block falls on the head of the tube. Such is the description of the pile-driving machine, which can be constructed in an hour out of the materials which are at hand on most farms and stations.

When the driving apparatus is fixed up, the first length of the pipe (that with the point on it) must be placed *perfectly* vertical under the centre of the driving block. To prevent it moving, a piece of batten may be placed at top and bottom between it and the guiding frame, and the man managing the pipe may hold a piece of rope round the pipe, so as to keep it steady in its place during the driving, in order to prevent the top of the pipe going either way when struck by the monkey or driving block, which it is apt to do unless kept perfectly upright. At first the taps on the top of it should be light till the pipe gets well into the ground. When well down, there is little danger of its going to either side, but it is wise throughout to keep it steady under the blows of the monkey. If the first length is carefully attended to and kept perfectly upright, there is little trouble with all the others.

When rock or other hard substance is come to, that is when the pipe ceases to go down easily under the blows of the monkey, it should be driven no more, as the pipe would bend where it is weakened by the holes if it got many blows after touching the rock.

When the pipe gets down to a depth where water may be expected, it is well to let a plummet down into it to ascertain if there is water. If so, and it has risen high, it may be well to screw on the pump and try if it is merely soakage water, or whether it has come on a spring. With the first pump I put down I found at twenty feet that there was eight or nine feet of water, and I tried the pump on it. I afterwards drove it to a depth of twenty-six feet, and the water rose twenty feet in the tube; notwithstanding, however, their being so much water in the tube, it came up at first only slowly, and there was great pressure on the handle of the pump. It required several hours' pumping before the water became clear and came with a free flow. But the success of the pump may be judged from the fact that I fitted first two troughs containing each 59½ gallons connected together by a tube, and the two were filled in an hour and a quarter, the pump throwing out the water as fully at the end as in the beginning, showing that the springs were fully equal to the pipe, of which the bore is two inches.

The doubt I had about tube wells being equal to pumps which have a large reservoir of say six feet square, was that there was no reserve of water, and that they would exhaust under half an hour's pumping; but I now see that if you get a good spring it is quite equal to the pump with storage. Moreover, where there is a good spring, you can by the tube well get down to the bottom of it; whereas in well sinking, the men are obliged to cease working before they get down as far as would be desirable, by reason of the flow of water.

At first a great deal of mud comes up, then sand. The water gradually clears till it is as free from sediment as any of the other pumps.

The second pump I put down was in a more doubtful spot than the first. It had to be pumped a good while before water came. For a good while again it only gave about a gallon of thick water a minute. The pressure on the pump was so great that it was quite plain it was drawing the water through the ground, that it was, in fact, tearing springs open by main force. As the pumping went on, the water would clear for a while, and then apparently a fresh spring would be opened, and thick water would come again; but the flow improved gradually. After nearly an hour's pumping, it yielded a gallon every seven or eight seconds, and after that it required four or five hours' pumping before there was as full a flow of water as the pump was capable of throwing.

The third of the pumps which Mr. Danks has made for me has been down twice without getting on a spring. It came once on rock at twelve feet from surface, where there was no spring; next it came on rock at a depth of twenty-one feet. Here there was no water either. So great is the pressure of the pump at the bottom, when the pump is tried to see if it will open any springs that it drew mud up into the tube to a height of nine feet. It is of course no fault of the pump that it cannot get water anywhere. In these two cases, the loss was only that of three men working four or five hours, whereas sinking two wells and slabbing them, of twelve feet and twenty-one feet respectively, would have been a serious loss. The putting down of the pipe for one of these pumps is less labour than boring, and one ascertains for certain whether there is water or not.

There is not much difficulty in lifting the pumps. Get a piece of quartering for a lever, say fifteen feet long, put a bullock-chain round the pipe, with the hook to run on the chain; roll the other end round the lever. When the end of the lever is lifted, the chain tightens on the tube so thoroughly that it will not slip, and the tube will draw with a strong lift of the lever. When the end of the lever is lowered after the first lift of the pipe, the chain round the pipe will slip down; and when the lever is again lifted, it will tighten round the pipe, so that it will take the pipe up gradually without any re-adjusting or re-fixing of the chain.

I have heard it stated that tube wells collapse or cave in after a time. I think, however, considering how clear the water is which comes up in those I have down, that it would take a long time to bring about such a result. Neither can I see why, if any falling-in took place, it should not be pumped out as well as the mud and sand were in the first instance. But even if either of those I have did cave in after a few years, it is only a forenoon's work to lift them and drive them again a few yards off—which, of course, I would do, having ascertained that there was abundance of water there. At the worst, only the labour of driving the tube is lost, as the pump tubes can also be put down in an ordinary well if required afterwards. The piping is a little stronger and more carefully fitted than that for an ordinary well.

A No. 6 Abyssinian pump complete costs about £5 5s., and when a man gets handy at putting them down, fifteen shillings or a pound will cover the expense of driving them. Certainly no one ought to be without a good supply of water in his paddocks in summer when he can bring it up from a depth of 30 feet for, say, £6 10s. Most of the waterholes one sees are so filthy and impure in summer that it is enough to poison the milk, and to bring disease on and poison the blood of the animals who drink it. If animals have foul water we must expect fluke and pleuro. My cattle will not go even to waterholes supplied from springs when they can get the pure water in the troughs; and they drink vastly more of the pure water than they would of the impure.

Tools for Well Boring.

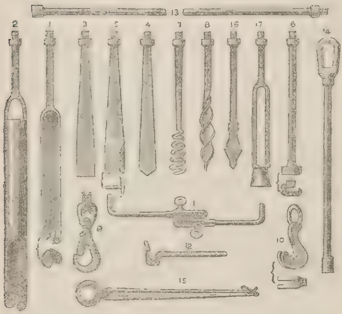


Fig 29.

No. 1. Auger for clay and stiff soil.
,, 2. Auger-nose shell, with valve for boring in clay, sand, etc., and bringing borings up.
,, 3. Square chisel, for moderately hard ground.
,, 4. V-nose chisel, for hard ground.
,, 5 T-nosed chisel, for hard and rocky strata.
,, 6. Crow's foot, for extracting broken tools.
,, 7. Spiral worm for extracting broken rods.
,, 8. Worm auger.
,, 9. Spring hook, with 30 feet of rope.

No 10. Lifting dogs, for raising rods.
,, 11. Tillers, for working rods.
,, 12. Hand dog, or rod wrench.
,, 13. Boring rod.
,, 14 Swivel joint.
,, 15. Pipe tongs.
,, 16 Spring dart, for drawing pipes from bore hole.
,, 17 Bell box, for broken rods, drills, etc.

The above figures show our different Tools adapted for Well-boring. The use of each will readily be seen. In ordering, please give in addition to the number given on the article the fig. placed underneath the set.

Special Water Lifters,

FOR RAISING LARGE QUANTITIES OF WATER AT A SMALL COST AND POWER.

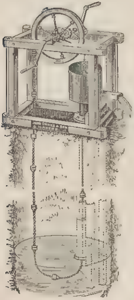


Fig. 30.

Suitable for quarries, gravel pits, contractors, irrigating, drainage, stock watering, and all purposes where efficient and durable pumps are required.

ADVANTAGES CLAIMED BY OUR IMPROVED PUMP.

The PATENT BUCKET contains one casting only, has no leather packing, and is therefore specially adapted to warm climates. Is made durable and watertight by very simple means; and, owing to the entire absence of bolts and nuts in connecting the various parts of the chain and buckets together, the wear and tear is reduced to a minimum.

Size	Power and Height.		Quantity per Minute.	Price with Frame for [illegible]2 ft.	Price per foot extra.	Price of 17 ft. complete with Horseworks.
1	One Man	30 feet	10 gals.	£16	10s.	
2	One Man	10 feet	30 ,,	£13	10s.	
3	One Man	8 feet	40 ,,	£18	12s. 6d.	
4	[illegible]		60 ,,	£20	1[illegible]	
5	One Horse -	10 feet	200 ,,	£32	20s.	£75
6	Two Horses -	10 feet	400 ,,	£40	30s.	£100

Intending purchasers are requested to state the quantity of water required, and the height from the surface of the water to which it is to be raised, and the power at their disposal to work the pump, and full particulars will be sent.

We guarantee our Water Lifters to be constructed of the best material. They are entirely self-contained, and can be put together by any person not requiring skilled labour to erect them. The wear is nominal, and the Water Lifter does not require any fixing below the surface of the ground, all being made fast from the frame.

Monitor Pumps.

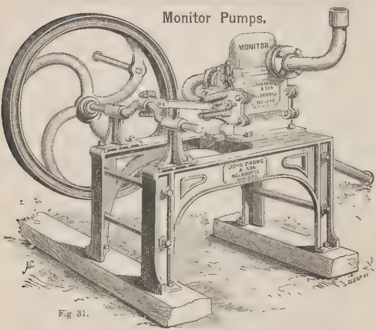


Fig 31.

These pumps are well and favourably known for pumping large quantities of water from rivers, creeks, dams, etc. Their uses amongst Water Trusts, Shire Councils, hop growers, flour mills, as well as for irrigation purposes, have gained for them a reputation giving them precedence over all other pumps where manual or horse power is used. Being a double-action pump, and forcing almost a continuous stream, would suit admirably for a fire pump in a small township. We make them mounted on four wheels, fitted with hose, so that the pump can be working at five minutes' notice. They are made of cast-iron with heavy fly wheel, crank, and gun metal bearings; the buckets are capped with leather of the best quality. The connections are so arranged that the pipes may be placed at any angle to save cutting away the embankments, etc., without in any way reducing the quantity of water discharged by pump. They have been worked in various parts of the colony, and have at all times given every satisfaction. We make this pump suitable for hand, horse, or steam power.

Table showing approximate quantity of water discharged by Monitor Pumps at 40 strokes per minute.

Diameter of Pump in inches.	Diameter of Suction and Delivery Pipe in inches.	Length of Stroke in inches.	Gallons delivered per hour.
4-inch	2	4	800
5 inch	$2\frac{1}{2}$	5	1,500
6-inch	$3\frac{1}{2}$	6	2,500
8-inch	6	8	6.800

The quantity discharged may be increased or diminished according to the speed of pump. To ensure safe working we never recommend them to be worked at a greater speed than from 40 to 50 revolutions of crank per minute.

Centrifugal Pumps.

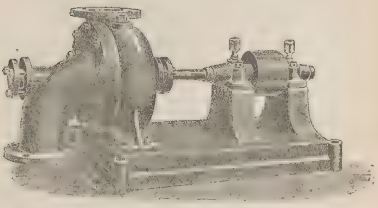


Fig. 32.

This class of pump has earned for itself a world-wide reputation for pumping large quantities of water within a reasonable time with only the minimum amount of power. Our pumps are carefully designed and constructed on the most scientific principles, being a combination of all the latest improvements. We claim for them the following advantages:—Firstly, accessibility to the interior of pump without breaking or disturbing the joints so as to allow the case to be removed. Secondly, substantial and heavy standards for spindle, thereby preventing undue strain on the spindle. Thirdly, it can be fixed without loss of time or other inconvenience. The suction and delivery pipes may be fixed either vertical or horizontal as required. Being agents for Messrs. Ransomes, Sims & Jefferies Limited engines, as well as manufacturing the pumps, places us in a position to supply a first-class article at the lowest price.

Our illustration represents one of our Double Standard Pumps. It is mounted upon a strong cast iron bed, it has long bearings as may be seen, and is as perfect and strong as engineering skill can make it.

PRIMING.—These pumps will not start without being filled with water, or by exhausting the air, which may be accomplished with our ordinary Steam Ejector.

To use the Ejector it is necessary to screw the suction end into the plug hole provided for that purpose, and connect the steam supply pipe with the boiler. Stop the end of the discharge pipe with a board with a piece of leather or cloth upon it, and start the Ejector; when the Ejector begins to throw water, start the pump. The suction pipe should never be larger in diameter than the size of the pump.

Centrifugal Pump.

(FIXED ON A WOODEN STAGE.)

Fig. 33 represents our Centrifugal Pump and Portable Engine, set up and in operation on river bank for irrigating. These pumps are generally fixed on a wooden stage over a river, canal, or a well, and are specially adapted for all systems of irrigation where it is not necessary to transport the pump frequently from place to place. These pumps are being largely used for sheep washing throughout the colonies, and are the cheapest and best for the irrigation of maize, orchards, cotton, coffee, sugar cane, rice, etc.; they are also rendering good service in pumping out sewers, canals, and other engineering works. When necessary the engine may be fixed some distance from the pump.

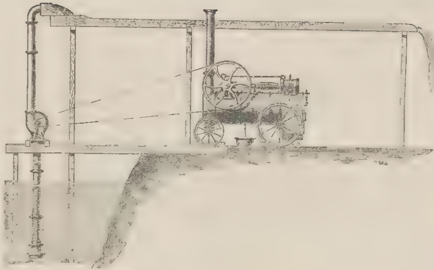


Fig. 33

Centrifugal Pump.

(MOUNTED ON TWO WHEELS.)

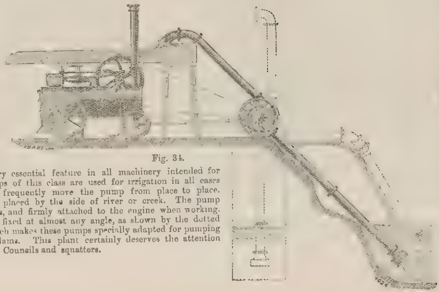


Fig. 34.

Our experience in almost every class of pumping machinery, especially that which is used for temporary purposes, has taught us the advantage and disadvantage of the various systems adopted. We are, therefore, prepared to offer our clients a really reliable pumping plant at a very moderate price, in the construction of which a great deal of attention has been paid to overcome all difficulties. Portability is a very essential feature in all machinery intended for temporary use. The pumps of this class are used for irrigation in all cases where it is necessary to frequently move the pump from place to place. The machinery is quickly placed by the side of river or creek. The pump is placed upon two wheels, and firmly attached to the engine when working. The suction pipe may be fixed at almost any angle, as shown by the dotted lines—an arrangement which makes these pumps specially adapted for pumping from shallow wells and dams. This plant certainly deserves the attention and consideration of Shire Councils and squatters.

The following table gives details of Centrifugal Pumps, arranged for lifts of 10 and 80 feet. Special estimates will be furnished for pumps for any other height of lift or quantity of water.

Speed and Power List.

Diameter of Pipes	Diameter of Flanges	Approximate quantity of water raised in gallons per minute	Driving Pulley	LIFT IN FEET. 10		20		30		40		50		60		70		80	
			diam. width	Nominal H.P. required	Revolutions per minute	Nominal H.P. required	Revolutions per minute	Nominal H.P. required	Revolutions per minute	Nominal H.P. required	Revolutions per minute	Nominal H.P. required	Revolutions per minute	Nominal H.P. required	Revolutions per minute	Nominal H.P. required	Revolutions per minute	Nominal H.P. required	Revolutions per minute
2	6½	50 to 75 gallons	4 by 3	1	983	1	1,298	2	1,538	1	1,766	2	1,796	2	2,083	2	2,232	3	2,371
3	8	100 ,, 150 ,,	4 ,, 4	1	873	1	1,153	2	1,366	2	1,570	3	1,708	3	1,852	4	1,984	4	2,108
4	9	200 ,, 300 ,,	5 ,, 5	1	786	2	1,038	3	1,230	4	1,413	6	1,537	6	1,666	8	1,785	8	1,897
5	10½	350 ,, 500 ,,	6 ,, 6	2	715	4	944	6	1,118	8	1,285	8	1,397	12	1,515	14	1,623	16	1,725
6	12	500 ,, 750 ,,	8 ,, 6	3	655	5	865	7	1,025	9	1,161	10	1,281	14	1,389	16	1,488	18	1,581
7	14	700 ,, 1,000 ,,	8 ,, 8	3	561	6	741	8	878	10	1,009	13	1,098	16	1,190	18	1,275	20	1,355
8	15	1,050 ,, 1,575 ,,	10 ,, 9	4	491	8	649	11	769	15	888	18	898	22	1,041	26	1,116	30	1,185
10	17	1,500 ,, 2,150 ,,	16 ,, 10	6	393	10	519	15	615	20	707	25	768	30	833	35	872	40	948
12	20	2,000 ,, 3,000 ,,	18 ,, 11	8	328	14	433	20	512	28	580	35	640	40	695	48	744	...	791
15	23	3,500 ,, 5,000 ,,	20 ,, 12	12	262	25	346	35	410	48	471	60	512	70	555	...	595	...	632
18	26½	5,000 ,, 7,500 ,,	24 ,, 14	17	218	35	288	50	342	...	387	...	427	...	463	...	476	...	527
21	30	7,500 ,, 11,250 ,,	30 ,, 14½	25	187	50	247	...	293	...	336	...	366	...	397	...	425	...	472
24	33	9,000 ,, 15,500 ,,	36 ,, 16	30	164	60	216	...	256	...	290	...	320	...	347	...	396	...	395

c 2

Fig. 35 represents one of our smaller sizes of Centrifugal Pumps for shallow lifts, and where work required to be performed is not too heavy. This pump requires only very light and inexpensive foundation, and has proved to be very suitable and serviceable to persons irrigating small areas.

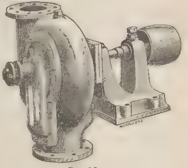


Fig. 35.

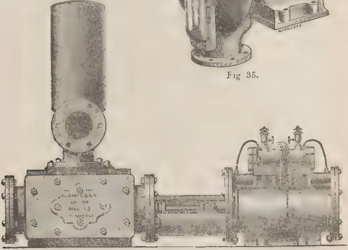


Fig. 36.

Steam Pumps.

We have long given a great deal of attention to steam pumps (see Fig. 36). We have supplied them for the purposes of supplying up-country towns with water, for watering stock, supplying railway stations, pumping out excavations, and for contractors' and general engineering purposes. We make them in several sizes, with capacities as under :—

Diam. Steam Cylinder	3in.	3in.	4in.	4in.	4in.	5in.	6in.	6in.
Diam. Water Cylinder	1½in.	3in.	2in.	3in.	4in.	4in.	3in.	4in.
Gals. per hour, approx.	450	1,800	800	1,800	3,200	3,200	1,800	3,200

Particulars of larger sizes on application. For factories, hotels, and public buildings, wherever steam is used, this class of pump is most valuable, as it is always ready, and with it a stream of water may be thrown on a fire in a few seconds. A pipe from the pump may run through every room having an outlet, with a hose attached, and a number of streams may be thrown at once.

N.B.—The suction pipes should be well tested by water-pressure, and the joints made perfectly tight. Air leaks in the suction pipes are generally blamed on the pump, and are very difficult to discover when the pipes are fixed.

If the pump has to draw above a few feet in height, it will work all the better for having a retaining valve on the bottom of the suction pipe.

Steam Pump in Operation.

Fig. 37.

Donkey Pumps,

FOR FEEDING BOILERS AND RAISING WATER.

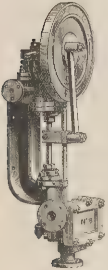


Fig. 38.

These Donkey Pumps supply a long-felt want in the shape of Boiler Feeders, especially for engines running at a very high speed, where it is absolutely necessary to dispense with the ordinary feed pump on account of the wear and tear when worked at such speed. It also does away with necessity of running engine during meal hours in order to pump water into boiler. These pumps are very useful wherever liquids require to be forced, such as in breweries, distilleries, gas works, chemical works, etc.

TABLE OF SIZES OF PUMPS.

Size.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	*No. 8.	No. 9.
Diameter of Steam Cylinder, in.	$1\frac{7}{8}$	$2\frac{1}{8}$	$2\frac{1}{2}$	$3\frac{1}{8}$	$3\frac{3}{4}$	$3\frac{3}{4}$	$4\frac{1}{2}$
Diameter of Plungers, inches ...	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{7}{8}$	$2\frac{1}{4}$	$2\frac{1}{4}$	$2\frac{1}{2}$
Stroke, inches	2	$2\frac{1}{2}$	3	4	4	4	6
Gallons raised per hour... ...	50	100	150	250	400	700	900
Horse-power of Boiler supplied	4	8	12	20	30	40	60

No. 3 is designed specially for small Steam Launches, and has cylinder and pump cast in gun-metal. Nos 4, 5, 6, 7, and 9 are single-acting, with gun-metal rams and glands No. 8 is double-acting. All clack valves are made in gun-metal for pumping hot water, unless otherwise ordered.

Danks' Bush Fire Extinguisher.

Fig. 39.

Fig. 39 represents our celebrated Fire Pump, mounted on Tank with wheels. This class of pump has found great favour with squatters and others, and has proved exceedingly useful in extinguishing bush fires, watering vineyards and orchards, also for use as a water cart. The tank, when filled with water, may be drawn by one horse. It is fitted with retaining valve, suction and delivery hose of first-class quality. It will be readily seen that in point of effectiveness this pump supersedes anything intended for the same purpose, as the water effectually extinguishes the fire, leaving the grass and timber saturated with water, thereby preventing any possibility of another outbreak.

Danks' Special Transport Irrigation Plant.

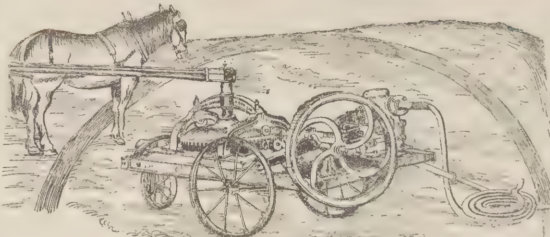


Fig. 40.

Fig. 40 represents our Special Transport Irrigation Plant, consisting of Monitor Pump and Horse Gears, mounted on wheels, suitable for easy transport from place to place as circumstances require. This description of plant has been specially designed and constructed for irrigating land along river banks, or pumping water from dams and creeks for watering stock and supplying farm houses, etc. To fix the plant it is only necessary to sink holes in the ground to receive the wheels; then fill up same so as to make it solid, at the same time exercising due caution to have the pump and horse gears perfectly level. These pumps may be fitted with hose or iron pipe as required, provision being made for either.

EJECTORS OR WATER ELEVATORS

FOR RAISING WATER AND CONVEYING LIQUIDS.

These Ejectors are the most effective agents, within recognised limits, that can be employed for raising water and conveying liquids—in many cases the only ones that can properly do the work.

They are a marvel of simplicity in construction.

They require only a small quantity of steam to keep them going, and in this respect have a great advantage over syphons and other contrivances which use a great deal, and in many cases have been dispensed with altogether on that account.

Sectional View.

Fig. 42.

RAISING WATER.

They are applicable in a great variety of forms for raising water and fluids from tanks, wells, ponds, mines, quarries, holds of vessels, docks, gas works, wheel pits, and other receptacles too numerous to mention.

As a bilge pump, these Ejectors have no equal.

These Ejectors are very compact in shape and do not occupy much space, and hence may be placed, at little expense, near the work to be done, which would be impossible in many instances with steam pumps or other pumping appliances. They have another advantage in being portable, and capable of being moved readily, with little trouble, from place to place, which is a very desirable feature where the duty they are required to do is not of a stationary character.

CONVEYING LIQUIDS.

In this varied field of operations the Ejector, as a means of raising liquids from one floor to another, or conveying them from vessel to vessel, is a method that stands unrivalled in directness and effectiveness; and in breweries, chemical works, and other places where the liquid is to be kept in a heated condition, its use becomes an absolute necessity. It can also be employed to great advantage, instead of pumps, in distilleries, sugar refineries, paper mills, tanneries, print, dye, and other works, where liquids, in various forms of consistence, are required to be raised or conveyed from place to place. It will take the liquid at a temperature of 175 degrees.

The pressure of steam needed to force liquids to different heights will be found in the table of capacities hereafter given.

GENERAL INSTRUCTIONS FOR APPLYING EJECTORS.

For the purpose of general information, it may be stated that the method of attaching Ejectors is very simple, namely, a steam pipe with valve, a suction pipe and a discharge pipe these being of more or less length and diameter, according to the depth from, and the height to which the water has to be raised, and the size of the Ejector necessary to do the work. MORE PARTICULARLY :—

1st. The steam suction and delivery pipe must be of the diameter given in our table of capacities for each size Ejector, respectively.

2nd. All the pipes and fittings to be perfectly air-tight, especially the suction pipe, which should also have a strainer attached to the end of it.

Note 1. *Be sure the suction pipe is perfectly air-tight.*

Note 2. Where the steam has to be taken a long distance to the Ejector, the steam pipe should be a *size larger* than that given in the table, and the same rule will apply to the suction pipe, when the water has to be drawn horizontally from a long distance.

Note 3. In case of absolutely or comparatively clean water, and in liquids which are all to be moved, a strainer is not necessary on the suction pipe.

Note 4. Should the Ejector not work immediately, do not tinker with it, but look for the difficulty elsewhere leaks in the suction pipe, for instance.

TO OPERATE THE EJECTORS.

To START.—Open the valve or cock in steam pipe slightly for a few seconds to let the condensed steam blow through, then open full.

To STOP.—Close the steam valve.

N.B.—Steam to operate the Ejector should be taken from the highest part of the boiler; especially in case of long distances is dry steam necessary.

THE EJECTOR WILL FORCE WATER OR LIQUIDS AS FOLLOWS:—

At 14 lbs. steam pressure	...	20 feet in height.
,, 28 ,, ,,	...	40 ,, ,,
,, 42 ,, ,,	...	60 ,, ,,
,, 56 ,, ,,	.	75 ,, ,,
,, 70 ,, ,,	.	90 ,, ,,

And upward, according to pressure.

CAPACITY OF EJECTORS.

Number.	Delivery per hour in Gallons at 45 lbs. steam pressure.	Diameter of Steam Pipe in inches.	Diameter of Delivery Pipe in inches.	Diameter of Suction Pipe in inches.	Boiler Capacity, Horse Power.
000	250	⅜	½	¾	3 to 4
00	500	½	¾	1	3 ,, 4
0	900	¾	1	1¼	3 ,, 4
1	1,200	¾	1¼	1½	5 ,, 6
2	2,000	1¼	1½	2	7 ,, 8
3	3,000	1¼	2	2½	10 ,, 15
4	5,000	1½	2½	2½	25
5	8,000	2	3	3	35
6	10,000	2½	4	4	45

At 80 lbs. steam pressure the Ejector will throw 50 per cent. more water.

LARGER SIZED EJECTORS MADE TO ORDER BY CONTRACT.

In ordering Ejectors please give:—

1st. The nature, quantity and temperature of the liquid; also, the depth of suction, and the height to which it has to be raised.

2nd. The pressure and quantity of steam available for needed purposes.

☞ Attention to these details will ensure an Ejector suitable to all the various conditions under which they may be applied.

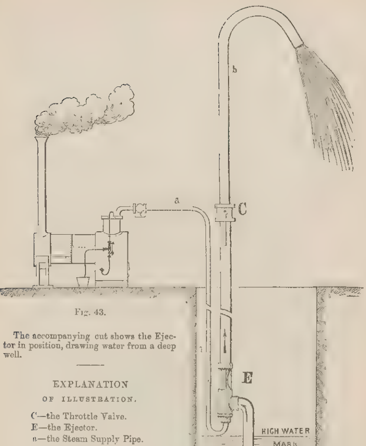


Fig. 43.

The accompanying cut shows the Ejector in position, drawing water from a deep well.

EXPLANATION

OF ILLUSTRATION.

C—the Throttle Valve.
E—the Ejector.
a—the Steam Supply Pipe.
b—the Discharge Pipe.
d—the Suction Pipe.

The Ejector E should be placed in a convenient position near the high water level, as in the sketch, and the Suction Pipe extended to low water mark.

It is proper to put a strainer on the lower end of the Suction Pipe, but no foot valve is needed.

In case the water contains chips, weeds, grass, etc., it would be desirable to make a Throttle C in the Delivery Pipe. By closing this an instant, the strainer could be blown clear of all such accumulations.

The Patent Pulsometer Direct-Acting Steam Pump.

The simplest, best, and cheapest apparatus for raising water and other liquids and mixtures without the intervention of mechanical appliances. The most useful and economical pump for Breweries, Brick Yards, Chemical Works, Gas Works, Oil Works, Paper Mills, Sugar Houses, Tan Yards, Dye Works, Mines, Foundations, Dry Docks, Sewers, Wells, Hotels, Railroads, Steamboats, Wreck-raising Vessels, etc.

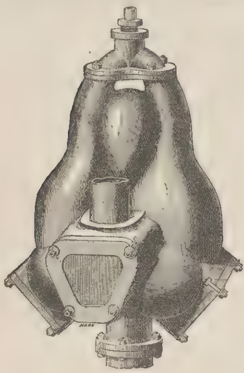


Fig. 44.

THE PULSOMETER is an apparatus whereby water, and most other liquids, whether clear or turbid, may easily by the force of steam be raised in a constant stream to a height of from fifty to eighty feet, without the intervention of any of the usual component parts of a pumping engine. That is to say, there are—

No Cylinders
No Pistons
No Glands
No Stuffing-boxes
No Rods

but simply *one Steam Ball* to control the admission of steam at each pulsation; *Suitable Chambers* for containing alternately the liquor to be pumped and the steam which pumps it; and the usual number of *Inlet and Outlet Valves* which are used in all reciprocating pumps.

The action of the Pulsometer will be understood by reference to the annexed sectional diagram (Fig. 45).

The Pulsometer consists of a single casting called the body, which is composed of two chambers (AA) joined side by side, with tapering necks bent towards each other, and surmounted by another casting called the neck (J) accurately fitted

and bolted to it, in which the two passages terminate in a common steam chamber, wherein the ball-valve (I) is fitted so as to be capable of oscillation between seats formed in the junction. Downwards, the chambers (AA) are connected with the induction passage (C), wherein the inlet valves (EE) are arranged. A discharge chamber, common to both chambers, and leading to the discharge pipe (D) is also provided, and this also contains one or two valves (FF), according to the purpose to be fulfilled by the pump.

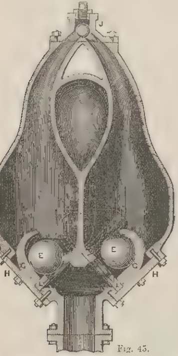


Fig. 45.

The air-chamber (B) is made sometimes in the same casting as the chambers, *but now usually separate*, and communicates with the suction. In some instances it is divided by a diaphragm, and one portion communicates with the suction and the other with the delivery. The induction and discharge chambers are closed by covers (HH) accurately fitted to the outlets by planed joints, and readily removed when access to the valves is required. (GG) are guards which control the amount of opening of the valves (EE). Small air-cocks are screwed into the cylinders and air-chambers, for use as will be hereafter described. These are the general outlines of the construction of the apparatus, and they are sufficient for the understanding of the nature of its operations.

The pump being filled with water, either by pouring water through the opening in the chamber, or by drawing the charge, as can readily be done by attention to the printed directions, is ready for work. Steam being admitted through the steam-pipe (K) (by opening to a small extent the stop-valve), passes down that side of the steam neck which is left open to it by the position of the steam ball, and presses upon the small surface of water in the chamber which is exposed to it, *depressing it without any agitation*, and, consequently, with but very slight condensation, and driving it through the discharge opening and valve into the rising-main.

[It should here be noted that the success of the Pulsometer is in great measure due to the arrangements for preventing the steam from being largely *condensed* by contact with the water or other liquid which is to be pumped during the emptying of the chamber. To this effect the peculiar form of the chambers greatly contributes, but it is also believed that the admission of air (through the air-cocks) which is afterwards somewhat condensed by the rising of the water, tends to prevent the intimate contact of the steam and water. That a successful result *is* produced is easily shown by the small amount of heat which is imparted to the discharged water by the steam which has raised it.]

The moment that the level of the water is as low as the horizontal orifice which leads to the discharge, the steam blows through with a certain amount of violence, and being brought into intimate contact with the water in the pipes leading to the discharge chamber, *an instantaneous condensation takes place*, and a vacuum is in consequence so rapidly formed in the just emptied chamber, that the steam ball is pulled over into the seat opposite to that which it had occupied during the emptying of the chamber, closing its upper orifice and preventing the further admission of steam, allowing the vacuum to be completed; water rushes in immediately through the suction pipe, lifting the inlet valve (E), and rapidly fills the chamber (A) again. Matters are now in exactly the same state in the second chamber as they were in the first chamber when our description commenced, and the same results ensue. The change is so rapid that, even without an air vessel on the delivery, but little pause is visible at the discharge opening, and the stream is, under favourable circumstances, very nearly continuous. The air-cocks are introduced to prevent the too rapid filling of the chambers on low lifts and for other purposes, and a very little practice will enable any unskilled workman or boy so to set them by the little milled nut that the best effect may be produced. The action of the steam ball is certain, and no matter how long the pump may have been standing, it will start as soon as dry steam is admitted.

The steam ball, if once made true, wears itself and its seats true, as it *turns in its bed* at every stroke, so that no part of its surface falls twice in succession upon the seat.

A principal feature of the Pulsometer is *The readiness with which the few wearing parts can be immediately replaced.*

The *neck and steam balls* are so constructed as to be replaced by the slacking of four bolts; and necks and balls to suit all sizes of Pulsometers are kept in stock. But practically the *wear is imperceptible*, and renewals extremely unfrequent.

Non-Return Valves are desirable on high lifts, and are kept in stock of all sizes.

The Suction Air Vessel (B) forms part of the Pulsometer, and is included in the price.

Air Vessels for the Delivery are also kept in stock, are usefully employed where a perfectly constant stream is required, as, for example, for fire-extinguishing purposes.

It will pump water, and a great variety of other liquids and semi-liquids, to a total height of from 50 to 70 feet. The sizes 1 and 2 are best adapted to a suction of from 6 to 8 feet, and to a vertical discharge of from 25 to 40 feet; the sizes 3 to 4 to a suction of from 8 to 12 feet, and a vertical discharge of 40 feet; sizes 5 and upwards to a suction of from 10 to 15 feet, and to a vertical discharge of from 40 to 60 feet. These figures are, of course, modified by circumstances, and we have pumps fixed on higher lifts, but the above may be safely taken as a guide. The length of *horizontal* suction and discharge is not very material if sufficient size of pipe be employed (as with other pumps) to obviate the effects of friction.

The Pulsometer will, on a constant suction, *work day and night without attendance*—in fact, as long as steam and water are supplied to it. This could not, we think, be said of any other steam pump.

The Pulsometer will raise, in combination with the water, a large quantity of foreign material—e.g., from 15 to 20 per cent. of *mud, sand, gravel, sewage, pulp*; and the wear in this operation is small, and by no means so destructive, as in the case of other pumps.

The Pulsometer will throw a very effective stream *through a nozzle*, as a fire or deck-washing engine, and when thus used, the use of an air-vessel is recommended.

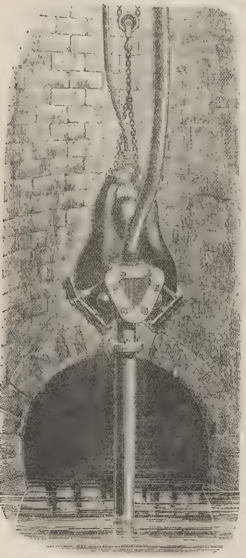


Fig. 6

The Pulsometer will work just as well *suspended from a chain or rope* as if it is permanently fixed, its very small size, in proportion to the quantity of water thrown, making it available in a great variety of situations where no other pump can possibly be applied, and we confidently recommend it as certain to give satisfaction in the most awkward positions, and for the most trying work.

It is a far easier thing to hang up a Pulsometer by a chain down a quarry side or in a well, with one length of rising main attached, and a flexible steam hose, than to sling any of the forms of direct acting pumps on its platform, especially as in the latter case the *exhaust steam* has to be provided for, whilst the Pulsometer disposes of its own. In a case of this kind recently undertaken, the exhaust steam pipes from one of the direct-acting pumps which had been previously fixed made the well so hot as to preclude all operation by the workmen, whilst the Pulsometer made no objectionable increase in the temperature. For the latter reason especially, it is invaluable for *underground pumping in mines, etc.*

Fig. 47.

The Pulsometer will work *under water*. This is not, of course, a desirable situation, but instances occur in which it may be needful so to start it, and it will be found quite practicable to set it in motion by admitting steam. Hints on this point will be found in the instructions.

The Pulsometer can be worked on low lifts with *exhaust steam*, or steam which has done its work, and in such cases its operation actually costs nothing.

The Pulsometer will pump many *chemical liquors*, especially those which, by their tendency to crystallize, give endless trouble when piston or centrifugal pumps are used such, for example, as solutions of sulphate and carbonate of soda. The advantage obtained by the absence of wearing parts on this class of liquors will be readily appreciated by the owners of chemical works. The *material of which the Pulsometer is composed is varied* to suit the nature of the liquor to be raised.

HINTS, Etc., AS TO THE ORDERING OF PULSOMETERS.

1. If the Pulsometer is required for raising cold water only, no other information will be needed before ordering than is afforded by this pamphlet, the height to which the various sizes will raise it being stated, and the quantities being given in the price list; but a deduction for friction, etc., must be made in the latter, if the lift required is over 25 feet total height.

2. In ordering a Pulsometer for other liquids, it is desirable to specify the density and nature of the liquid which it is desired to raise, and whether it contains any corrosive matter in solution.

3. Whether there are any foreign matters mechanically mixed with it, as sand, gravel, lime, or the like, and if so, in what proportion.

4. The total height to which the liquid is to be raised.

5. The length, if any, of horizontal suction and horizontal delivery.

6. The temperature of the liquid.

7. The steam pressure available at the pump. Roughly speaking, it may be said that under favourable conditions the steam-pressure required is but little in excess of that theoretically needed to counter-balance a head of water giving such a pressure, and the most favourable results on a total lift of 40 feet have been made with steam of 25 lbs. But something depends upon the situation of the pump, the proportion of length of suction and delivery; and on lifts of 60 to 70 feet it is desirable to have not less than 50 lbs. of dry steam at the pump. These figures apply to water, and on denser liquids the total height will, of course, be diminished with the same steam-pressure.

8. A foot-valve should, as in the case of Centrifugal pumps, be always ordered with the Pulsometer. Non-return valves are very useful on high lifts, as they remove from the pump the shock of the column of water, but are not necessary to the action of the pump.

HINTS AS TO THE PLACING OF THE PULSOMETER.

If the height of the supply in the well, cistern, or excavation varies, it is better to hang the pump by a sling, and to lower as required.

Nothing can be easier than this - the foot-valve is placed immediately under the pump, where it is always accessible by the side door, and the rising main can be added as wanted, whilst the steam pipe is either a flexible steam hose, or is added to at the same time as the rising main. The pump is controlled from above by a wheel valve, which should in all cases be used instead of a cock.

If the pump is to have a permanent length of suction and delivery, it is well to fix it, which can be done by merely allowing it to stand on the suction pipe foot-valve; or two planks can be put under it to support it. In any case the expense and time needed are most trifling.

DIRECTIONS.

The most important point to be attended to, and one which is so often overlooked in fixing other pumps is, that *dry* steam should be supplied. As the action of the pump depends upon rapid condensation, it will be evident that if a quantity of hot water is supplied to it along with the steam in the steam-pipe, some of the useful effect will be lost. It is well, therefore, to continue the steam-pipe a foot or two below the branch which supplies the Pulsometer, and let it terminate in a small cock from which the condensed water can be occasionally drawn off, and to cover the pipe, if of iron, with some non conducting material. The steam-hose needs no covering.

THE PULSOMETER

CAN NEVER BE WORN OUT,

WILL PUMP ALMOST ANYTHING,

REQUIRES NO FIXING,

NEEDS NO SKILLED ATTENDANCE,

NEVER REQUIRES OIL, TALLOW, OR PACKING,

OCCUPIES LESS SPACE THAN ANY OTHER PUMP,

AND IS CHEAPER THAN ANY OTHER PUMP.

Applications of the Pulsometer.

One of the largest fields is in the execution of such works as Excavation, Well-Sinking, the Pumping Out of Coffer Dams, the Formation of Dry Docks, the Elevation of Sewage, and in general all undertakings in which large quantities of water charged with grit, sand, and impurities, so prejudicial to other forms of pumps, are to be met with. In all these cases the large openings of the valves, the ready access to them, the durability of the valves and their seatings, cannot fail to render it an universal favourite, whilst its small weight, extreme facility of transport, and the absence of all necessity for expense or delay in fixing or foundations, must commend it to the attention of contractors generally. Its air valves are set to the required amount of opening, and its steam valve is controlled from above, and once thus arranged no further attention need be paid to it. For steamers the Pulsometer is unquestionably the best Bilge Pump made, as none of the foreign matters are likely to choke it. Grain, Pieces of Rope, Chips, etc., passing through it freely, and all the valves are easy of access in the event of any extraordinary obstruction arising. By being connected with a separate series of pipes, the same pump can also be used for Washing Decks, whilst as a Circulating Pump for surface condensers, it is the pump most economical of steam of any of the forms employed.

THE SATISFACTORY PERFORMANCE OF ALL PULSOMETERS ERECTED IN CONFORMITY WITH OUR ADVICE IS GUARANTEED.

No.	Height of Pulsometer in Inches.	Space Occupied	Size of Steam Supply Pipe.	Size of Suction Pipe.	Size of Discharge Pipe.	Imperial Gallons per Hour.
	Inches.	Inches.	Inches.	Inches.	Inches.	
1	15	10 × 8	¼	1½	1	[illegible]
2	18	15 × 11	¼	2	1½	[illegible]
3	29	19 × 15	½	3	2	[illegible]
4	31	23 × 20	½	4	2½	[illegible]
5	35	25 × 23	¾	4½	3	[illegible]
6	38	26 × 25	1	5	3½	[illegible]
7	44	30 × 26	1	5 or 6	4	17,000
8	54	37 × 32	1¼	6 or 7	5	26,000

All measurements and quantities must be considered as approximate. The number of gallons represents the discharge on a total lift of 15 feet, and an allowance must be made if the water has to be raised to a considerable height.

A foot valve is advisable in most cases. Prices of foot valves, steam valves, pipe, etc., on application.

PULSOMETERS ON HIRE.

391 Bourke St., Melbourne; 363 Pitt St., Sydney.

The Hydraulic Ram as We Build It.

Fig. 48.

The Hydraulic Ram as we build it to-day represents the most efficient and automatic labour-saving device known for raising water any distance where a sufficient supply and head is attainable, and the slight expense for first outlay and maintenance considered, renders them most desirable for supplying running water in any quantity to residences, villages, etc. With an experience of thirty-five years in their manufacture, and a practical knowledge of the requirements necessary for their successful operation, we are able to offer the most perfect and efficient Ram in the market. Our castings are all heavy in pattern, and of proportionate strength. The air chambers are larger than those of any other Ram, thus relieving it of all undue strain and aiding its working, while the valve stem and case (made of best bronze metal) are of a new and improved design, calculated to develop the greatest possible efficiency.

A few words will explain our plan. The water is taken through the drive pipe (the length and fall of same to be determined by results required) and forced upwards through the discharge pipe to the point of delivery. The conditions and requirements under which Rams are operated are so varied that we have thought best to treat these under separate heads, believing our customers will appreciate this arrangement, which will enable each purchaser to make his own selection from our goods, or furnish such data that we can readily make estimates and recommendations.

HEAD OR FALL OF DRIVE PIPE.

Rams will work, and successfully, where the spring or brook is only 18 inches higher than the Ram; yet, as the height or head increases, the more powerful the Ram operates, and its ability to force water to a greater elevation and distance correspondingly strengthens.

As a specific example, we might say a fall of 10 feet from the brook or spring to the Ram is sufficient to raise water to any point, say, 150 feet above the machine, while the same amount of fall would also raise water to a point considerably higher, though the quantity of water discharged will be proportionately diminished as the height and distance increase.

Again, when the requisite quantity of water is forthcoming from the Ram, operating under a certain fall, it is not judicious to increase this, for by so doing the strain on the machine is augmented, those parts doing the labour are overtaxed, and the durability of the Ram lessened.

LENGTH OF DRIVE PIPE.

Practical experience and experiments have proven that the best results are obtained where there is ample, though not excessive, length as well as fall to the drive pipe, for the weight of this volume of water is an important auxiliary in forcing water into the air chamber and through the delivery pipe.

We recommend drive pipes to be 50 to 75 feet in length, though in very heavy lifts this may be advantageously increased to 125 and even 200 feet. In cases where this is not practicable, the pipe may be bent in a coil 5 or 6 feet in diameter.

WATER RAISED AND WASTED.

The relative height of the spring or supply above the Ram, and the elevation to which it is required to raise, determine the relative proportion between the water raised and wasted, the quantity raised varying according to the height it is conveyed with a given fall; also, the distance the water has to be conducted, and consequent length of pipes, have some influence on the quantity delivered at the point of discharge, as the more extended the pipes through which the water has to be forced by the Ram the more friction there is to be overcome.

For ordinary purposes it is sufficient to say that in conveying water, say, 50 or 60 rods, it may be safely calculated that one-seventh of the water can be raised and discharged at an elevation five times as high as the fall, or one-fourteenth part can be raised and discharged, say, ten times as high as the fall or height of drive pipe.

Thus, with a fall of five feet for every seven gallons drawn from the fountain, one may be raised twenty-five feet, or half a gallon fifty feet; or with ten feet fall, one gallon of every fourteen may be raised to the height of 100 feet, and so in proportion as the fall or height is varied.

DIRECTIONS FOR PLACING RAMS AND PIPES.

Rams should always be secured to heavy timbers or masonry, and not be dependent merely upon pipe connections. This is important, as there is a constant concussion and strain upon the Ram, and it should have such a foundation as we recommend.

The Ram and pipe should also be carefully protected against frost, and turns in either drive or discharge pipe should be avoided if possible. When it is impossible to set the Ram without having elbows in the pipes, make the elbows as large as may be, so as to place as little obstruction to the free and easy flow of water as is practicable.

ESTIMATES.

We are always glad to be consulted on any matters pertaining to Hydraulic Apparatus, and will cheerfully make recommendations and prepare estimates, etc., on any plants. To do this, however, we should be definitely advised on the following points:—Quantity of water which can be supplied to the Ram. Quantity of water desired to elevate in any given time. Fall or head and distance from spring or brook to desired location of Ram. Height to which the water is to be raised.

Battery of Hydraulic Rams.

Fig. 49.

We have frequent inquiries for Rams of greater capacity than we build, and to meet this demand we offer a combination or battery of any number of Rams playing into a single discharge pipe.

These combinations offer certain advantages over Single Rams, for as each Ram receives its water through a separate drive pipe, the strain is not so great on pipe or Rams as if but one Ram were used; and then, too, in the event of accidents at any time the supply is not suspended, for each of the Rams acts independent of the others.

Brine Pump.

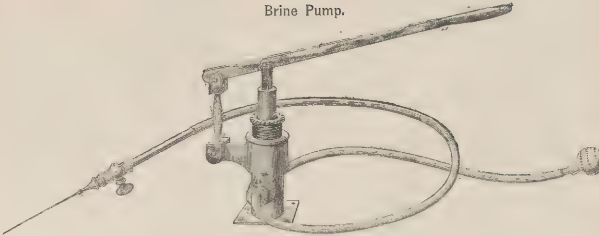


Fig. 50.

Fig. 50 represents our Brine Pump. We have much pleasure in introducing them again in our pamphlet. Among the ham and bacon curers and butchers, both in this and the other colonies, the highly satisfactory manner in which they perform their work have hundreds of times called forth well-merited praise. The Brine Pump is almost indispensable in any butchering establishment in such a climate as ours. Tons of meat are annually rendered unfit for human consumption by the excessively warm, humid weather to which we are subjected, and has to be thrown away, which could, by the use of this little machine, be saved by being pickled, thereby causing a saving of a vast amount of money otherwise lost. The Pump itself is made of the best gun-metal, and the base is arranged for bolting in the pickling tub. It is fitted with gland and long lever, which may be worked by a mere lad. We also supply both suction and delivery hose of the best quality, imported specially for pumping brine. The Needles are made from german-silver tube, so pointed at the end as to prevent the punctures showing in pork, or disfiguring it in any way. **We make these pumps in two sizes, viz.: 1½ inch and 2 inch. The prices are very moderate.**

Alston's Patent Iron Windmill.

Fig. 51.

The system of watering stock by means of a Windmill in this country is only in its infancy, but judging from the opinions formed by the few who have used them, we have no hesitation in saying that the day is not far distant when every farmer and stockowner will feel the absolute necessity of having one or more Windmills to do the work which he now so unsatisfactorily attempts to perform. A recent American paper says:—"A Windmill is almost as common an object on an American farm as a barn, or the house the owner resides in." Such being the case, our American friends are far ahead of us in farm management; for who can say it is good management to allow the cattle to go half famished for want of sufficient drink when perhaps the water is there in abundance, only a few feet below the cattle as they stand in the paddock wasting away from thirst, only requiring some reliable means of lifting it for them. Even a spring or waterhole has always more or less waste land about it, and when used for watering stock commonly

becomes a stagnant pool, in which in warm weather the cattle stand for hours wasting their time befouling the water, making it totally unfit for them to drink. The difference between hand and mill pumping is great. The waste of time and the hard work are not the only objections to hand pumping. The cattle are frequently neglected for hours at a time; when a trough full of cold water is pumped up for them they fill themselves, greatly to their injury. By experiment it has been demonstrated that stock having free access to pure water are kept at less expense and improve much faster. Time saved is money made to the farmer in busy seasons, not to speak of the comfort of the farmer in the extreme warm or cold weather, when sitting in the shade or by the fire quietly watching his mill as it patiently performs its duty, saving his energies for a wider field of usefulness, and adding years to his life. The Windmill is the cheapest power known to the world; its first cost is practically its only cost; it needs no skilled labour, and next to no attention; all that is required is to attend to the oiling about once a week to keep it in working order for years.

Alston's new patent Iron Mill we claim is the strongest mill made, its self-governing qualities making it safe in all weather. The wind-wheel is built entirely of wrought iron; each part and piece is so arranged that each forms a strengthening piece to the other; the spokes, rims, stays and sails all combine to make up a solid, rigid wheel, which it is almost impossible to get out of order. The sails cannot rot or become loose, as is the case with the ordinary wooden mills. The whole mill is governed by the wheel folding round in a line with the vane when the wind becomes too strong, thus pressing only its edge to the wind, keeping up a regular constant stroke of the pump-rod. The mill has a very sensitive turn-table, and adjusts itself to the change of the wind with the most perfect ease. The sails of the mill are made of galvanised iron, and are all blocked out into a concave form, which forms a special feature in the mill; the shape of the sail increasing the power of the mill considerably, as will be evident to anyone having any knowledge of the wind's power. The wind does not glance off the sail as in the ordinary plain flat surface; but being made hollow in the shape of a quarter circle, the wind enters at one angle and must follow the curved surface before it can leave the wheel, thus using its whole power before passing off. The spokes of the wheel are made of hollow tube, combining lightness with strength. The whole mill is supported on a neat and substantial frame, making a strong, compact, and at the same time one of the most useful machines ever placed upon a farm.

These mills can be fitted up with an automatic shut-off gear, so that when the tanks are filled the mill will go out of gear, and when any water is drawn off it will start again and replace that which was taken out, thus doing away with all unnecessary wear and tear, the mill taking the whole management upon itself; the only attention is to look after the oiling.

Do not leave the ordering of a Windmill till such time as you cannot do without it; every season we are obliged to send away orders because the would-be customer could not wait more than a few days. Your past experience should guide you as to your probable wants for the coming summer; and although when you may be reading this the waterholes are overflowing, you may depend upon it the summer will come again, bringing with it the same old story. The Windmill is a boon in a humane point of view; the windmill is a boon in a money-making point of view for those who use them. They save their cost the first and every season they are used; and it is the universal verdict of all that have used them that no man would be without them once he has had one at work. If you consider it worth your while to have a windmill to do your work and save your bodily exertions, improve your stock and thereby help to fill your pocket, send us the information required as given at the end of this article; post same to us, and we will gladly give all particulars as to price, etc.

Fig. 52.

The above sketch shows one of Alston's Patent Iron Windmills, 11 feet diameter, erected for the Town Council of Warrnambool, for supplying the Corporation Yards with water for stock and flushing purposes. The depth of the well is 65 feet to the water, and the tanks are raised 12 feet, making a lift of 79 feet. The pump used is one of our own make, a 3 inch cylinder, and the delivery and suction pipes are $1\frac{1}{3}$ inch. The supplying of this mill was a source of great controversy among some of the rival mill makers; consequently the mill was put to a severe test, the quantity of water pumped being accurately timed and measured in the presence of the late Town Engineer, Mr. Kerr, several Councillors, and townspeople. The result was surprising to all, the mill lifting 108 gallons more water per hour than it was specified to do.

Extract from the report of the meeting Warrnambool Town Council, 22nd February, 1887:—"The Mayor said, in the tenders for the market windmill they had accepted the lowest. With regard to this mill, it was estimated to supply 300 gallons per hour. The mill erected by Mr. Alston had been tested. On the first occasion it pumped 400 gallons per hour; that morning it had been again tested by the Surveyor, in the presence of Councillors Simpson and McGennen and Mr. Alston. They tested it for the first quarter of an hour, and then for the whole hour, the result being that 408 gallons were pumped during the hour."

Extract from *The Warrnambool Standard*, 23rd February, 1887:—"The windmill recently erected by Mr. Alston for supplying the cattle yards with water was yesterday tested by the Town Surveyor, Mr. Kerr, in the presence of the Mayor and Councillors Simpson and M'Gennen. There was a fair wind blowing from a northerly direction, and the windmill was set going at about half-past nine in the morning. Within an hour 408 gallons of water were pumped into the tanks. At a previous trial the quantity pumped was 380 gallons per hour. The result of yesterday's testing shows that the windmill has been constructed to pump even more than the specified quantity of water, as the amount mentioned in the specification was 300 gallons per hour. Mr. Kerr expressed himself as being highly satisfied with the windmill, which the maker has fitted up with a new style of self-acting lever, by which the mill is thrown out of gear when the tanks are full of water."

These mills were awarded first psize at the Villiers and Heytesbury Agricultural Society's Show, 1886.

First prize at the Koroit Agricultural Society's Show, 1886.

Prices of Alston's Patent Iron Windmills,

Without wooden frame, which is costly for carriage, and can easily be fitted up on the ground. We supply a plan and specification with each mill.

10 feet diameter ...	£18
11 feet "	20
12 feet "	25
14 feet "	30
16 feet "	35

Testimonials

RECEIVED BY THE PATENTEE.

"MILL WORKS WITH LOW WIND, ALTHOUGH MUCH SHELTERED."

Mr. J. Alston. Keilambete, *9th August*, 1887.

Sir, Your Windmills and Waterfroughs have given me much satisfaction. The mill works with low wind, although much sheltered; it raised plenty of water all the year. I would not want the Troughs and Mill one year for the cost of them.

Yours truly,

JAMES ARMSTRONG.

"NOT THE SLIGHTEST HITCH HAS OCCURRED."

Mr. James Alston. Garvoc, *9th August*, 1887.

Dear Sir,—In reply to your letter of the 3rd inst., inquiring my opinion of your patent Iron Windmill, I have much pleasure in stating that it has given every satisfaction. Not the slightest hitch has occurred in its working during the twelve months I have had it in use. A very slight breeze sets it in motion; it runs smoothly and easily, with a minimum of friction, and at the same time stands the roughest squalls with impunity. Its simplicity of construction is also greatly in its favour.

Yours truly,

W. H. CLARKE.

"NEVER FAILED TO SUPPLY THE STOCK."

Mr. Alston. Homewood, 8*th August*, 1887.

Dear Sir,—With reference to your patent Iron Windmill that you erected for me, I beg to inform you that I am highly pleased with it. One feature I find with it is that it revolves and pumps water with a very slight breeze of wind. It has never failed to supply the stock.

I am, dear Sir,

Yours respectfully,

W. PODGER.

"THE ONE THING NEEDFUL ON A FARM.

Valley Field, Garvoc, 9*th August*, 1887.

Dear Sir,—We have much pleasure in telling you that we are perfectly satisfied with your new patent Iron Windmill. It is giving us every satisfaction, and can strongly recommend it to the public as the one thing needful on a farm for labour saving. Last winter we had to keep a man going every day to pump water; this winter the result of your new patent Iron Mill is we are doing with one man less, saving wages and food.

We are, yours respectfully,

MRS. WM. DOY & SON.

"SUPERIOR TO MOST OF THOSE IN GENERAL USE."

Wollaston, Warrnambool, 9*th August*, 1887.

Mr. James Alston.

Dear Sir,—I have had one of your new Iron Windmills at work for some months, and it has given me entire satisfaction. It forces water through 600 feet of piping to a height of 75 feet, even in a light breeze. I consider your mill superior to most of those in general use, being so simple in construction, and proportionately cheap. The pump is the best I have ever seen.

Yours truly,

WALTER S. MANIFOLD.

"SIMPLE, EFFECTIVE, NOT LIABLE TO GET OUT OF ORDER."

Koroit, 16*th August*, 1887.

Jas. Alston, Esq.

Sir, In reply to yours of the 3rd, as to how the patent Iron Windmill supplied by you was acting, I must say that it has given me full satisfaction I consider it simple, effective, not liable to get out of order; and, considering the material used in construction, its durability should be unquestionable. You are at liberty to use this.

Yours truly,

PETER McVICAR.

"No Extensive Farmer Should be Without One."

St. Mary's, 22*nd August*, 1887.

Mr. Alston.

Dear Sir, I have much pleasure in stating to the public that the Windmill you erected for me on St. Mary's gives every satisfaction. No extensive farmer should be without one.

Yours, etc.,

JAMES LEE.

Patent Iron Watertroughs.

This is the most recent invention in watertroughs, and at the same time we claim it is the best watertrough ever produced. It is simple, strong, durable, and cheap; it will outlive three of the ordinary wooden troughs, and at the same time its first cost is less; it will not rot from damp, or crack from heat, like the wooden troughs. A coat of tar or paint about once a season is all that is required to make it last a lifetime. It has many advantages: it is easy to put together or take down again in case it may require to be shifted; it only occupies a small space in carting, each section fitting inside the other, and can be put together on the ground by anyone. Since these troughs were introduced last season some thousands of feet have been sold; several troughs 200 feet long have been sent to Queensland and the northern districts; and it is in these instances that the extreme simplicity and effectiveness of the invention is demonstrated. The small compass in which they pack, the freedom from risk of being damaged in transport, and the ease with which they are put together upon the ground at once places them foremost in the ranks of watertroughs.

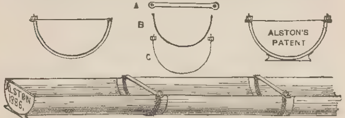


Fig. 53.

This sketch will very clearly show the principle of the invention, although the coupling is made in several other forms. It consists of three bands of iron —A, B, and C—and where the troughs are made of extra strong iron, the inside band can be dispensed with. In making the joint the curved sheets are lapped one inside the other, with a little paint or tar between. The band C is placed outside, the band B inside the trough; the tie bar A is placed over the ends of C, and the nuts screwed up. The result is, the outside sheet is drawn in, the inside sheet forced out, making a perfectly watertight joint. The ends of the troughs are put in by the same means, in which case the inside band is cast or rivetted on to ends. The smaller sizes, up to 24-inch, are made self-supporting; above that size they are made to be supported upon timber uprights—preferably red gum. The tie bar is made to extend past the outside band, and rests upon the tops of timber supports, and fastened thereto by two wood screws.

Testimonials.

"CAN WITH CONFIDENCE RECOMMEND IT."

Tooram, Allansford, *8th August*, 1887.

Mr. James Alston.

Dear Sir,—Having used your patent Iron Trough, both for feeding stock and flaming for irrigation purposes, it affords me pleasure to testify to its usefulness for both purposes. It is so simple that any man can put it together with rapidity; and, as far as my experience goes, it is easily taken to pieces, and is durable. I can with confidence recommend it to any person requiring it for either of the abovenamed purposes.

Yours faithfully,

T. McLEOD PALMER.

"THE BEST DESCRIPTION OF TROUGHING FOR WATERING STOCK."

Staywood Park, Warrnambool,
9th August, 1887.

Mr. James Alston.

Dear Sir,—The patent Iron Troughs you supplied me with have given every satisfaction, being light, yet strong and endurable. I consider them the best description of troughing for watering stock in the market.

I am, yours faithfully,

G. P. BARBER.

"IN EVERY WAY MOST DESIRABLE."

Werronggurt, *10th August*, 1887.

Mr. James Alston.

Dear Sir,—I have had some of your patent Iron Watertroughs in use for some time, and I find them in every way most desirable. They are perfectly watertight, easily put together and taken apart, and very handy in shifting from one paddock to another, and I should say they ought to be almost everlasting.

I am, dear Sir,

Yours truly,

THOS. F. RUTLEDGE.

"COMPLETE SATISFACTION."

75 Temple Court, Melbourne,
19th August, 1887.

Mr. James Alston.

DEAR SIR,—I have much pleasure in stating that your patent Iron Watertroughs that I sent to "Meadow Lands" gave me such complete satisfaction there, that I ordered some for "Manthan.," where they have been found to be equally efficient.

Yours faithfully,

N. THORNLEY.

Alston's Patent Iron Fluming.

As an irrigation Flume this has no equal; its first cost is cheaper than wooden or rivetted flumes. It is very easily erected, and where it has to be elevated to cross **low-lying grounds it has great advantages. The top bar in this case acts as a** suspension bar, thus a deal of time and expense is saved; when the timber supports are set in the ground with their tops levelled, all that remains to be done is to hang on the coupling, place the screws in top of post, and then place the sheets in their places, and screw up the two nuts; by which means the joints are made, and the whole flume is put together as firm and solid as if it were one piece of iron. Curves can be made with the fluming without affecting the joint, by taking a little at each joint. We are prepared to execute orders at special low rates where large quantities **are needed; prices on application.**

This fluming has been adopted by the Shire of Wimmera Water Trust for irrigation purposes; the Koroit Borough Council, to conduct the storm water from **the town over the lake bank; and by several private firms for similar purposes.** The Shire of Wimmera Water Trust having used some 2,422 feet of the above fluming on one of their works, the patentee wrote to the chief engineer of the works, Mr. J. D. Derry, asking his opinion of same, and received the following reply:—

To Mr. James Alston.

Dear Sir, —I have great pleasure in certifying to the simplicity and effectiveness of your fluming. Should I have occasion to require any more fluming, I shall certainly adopt your patented plan.

Yours truly,

J. D. DERRY.

Horsham, 31*st August*, 1887.

Corrugated Iron Water Tanks.

400	gallons.
750	„
1,000	„
1,200	„
2,000	„

We can supply the above at lowest prices.

Ransomes' New Steam Thrashing Plant.

Fig. 54.

JOHN DANKS & SON LIMITED, SOLE AGENTS.

391 Bourke St., Melbourne; 363 Pitt St., Sydney.

RANSOMES' "NEW AUSTRALASIAN" THRASHER.

This Plant will be found to combine every requisite and improvement suggested to R., S. & J. Ltd., by upwards of thirty years' large colonial experience, and is confidently described as very superior to anything of its class at present before the public.

The "New Australasian" Thrasher has been designed to meet in the fullest way the requirements of colonial users. At the request of many of their friends in all parts of the colonies, R., S. & J. Ltd. have reintroduced, for the colonial trade, their

FAMOUS ROTARY SHAKERS,

which, after being widely used in the colonies for more than thirty years, have remained the favourite type ; and they offer these for the first time in combination with the Improved Dressing Apparatus and extra large Sieve Surface, which they have used in their Standard Thrashing Machines during recent years, and which have earned their machines the highest place in the esteem of farmers of all countries.

The "New Australasian" Thrasher is also fitted with

THIRD BLAST UNDER THE CAVING RIDDLE,

which is recognised as a further special requirement for Colonial Thrashing, having been found the only reliable plan for enabling the Caving Riddle thoroughly to deal with the immense quantity of cavings which always present themselves in the hot dry climate of Victoria and the other colonies.

R., S. & J. Ltd., have no doubt that the "New Australasian" will be appreciated by all practical men. It assures

PERFECT SHAKING,
PERFECT SEPARATION OF THE CAVINGS,
PERFECT DRESSING.

It has all the advantages of their well-known Rotary Machines, combined with the improvements of modern English Thrashing Machine construction, and stands unrivalled for quick thrashing, and perfect cleaning and separation.

EXTRACTS FROM COLONIAL REPORTS.

Mr. DONALD McDONALD, Victoria, writes :—

"The Thrasher is giving great satisfaction. It is the only machine I ever saw that would make a perfect job in cleaning rye grass seed."

Mr. THOS. MARCHBANK, Broadford, Victoria, writes :—

"Your Thrasher has just finished its twenty-first season, and did nine weeks' work this season without any trouble. We did over 8,000 bags of corn in nine weeks."

Messrs. EVERINGHAM, GREENFIELD & Co., Ballarat, Victoria, write :—

"People have travelled many miles to see this machine working. There is no doubt but that this machine will keep up the fame of your establishment for turning out good serviceable machinery."

Mr. JAS. ROOK, Romsey, Victoria, writes :—

"I have one of your Engines and Thrashers, and have been working them for thirty years to my own and every farmer's satisfaction for whom I have thrashed."

W. HAWKE, Esq., Pendarves, Byng, New South Wales, writes :—

"Ransomes' Machines are still at the top of the tree; acknowledged by all to be the best cleaners, both of straw and grain, in the district."

Mr. ROBERT A. PEARSON, Armidale, New South Wales, writes :—

"I am working one of your machines, which has been running the last ten years. It is almost as good as ever."

Mr. J. R. CLEMENT, Waimate, Canterbury, New Zealand, writes :—

"Your machine is spoken of as the best that has ever been in the district. It has been tried on all sorts of stuff dry damp, and dirty and disposed of it all in the most satisfactory fashion, cleaning perfectly, never choking, and getting through a vast quantity."

Messrs. GEO. BOOTH & SONS, Christchurch, New Zealand, write :—

"Of the new Thrashing Machinery we placed two sets in the hands of good practical men, and the results we have had are favourable in the very highest degree. We are of opinion that your new machine is in advance of anything ever brought into this colony."

Mr. W. LLOYD, Kynsna, writes :—

"The capacity of the Thrasher for work is simply astonishing, and the owner is fully satisfied with it; so am I."

Portable Steam Engine.

This illustration represents a new design of Portable Engine, made by RANSOMES, SIMS & JEFFERIES Ltd., and embodying many recent improvements.

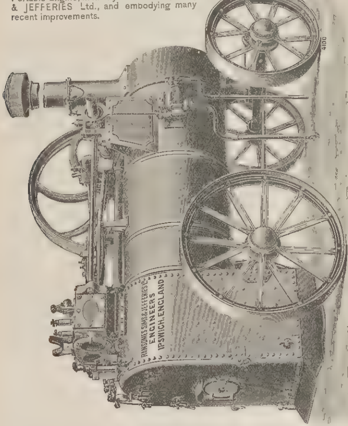


Fig. 55.

HORSE POWER One horse power is the expression of 550 foot-pounds of work done per second, or 33,000 foot-pounds of work done per minute.

ACTUAL HORSE POWER.—*To find the actual horse power of a steam engine.*—RULE: Multiply the area of the cylinder in square inches by the average effective pressure of the steam in lbs per square inch, minus 3 lbs. per square inch for friction, and by the product of twice the length of stroke in feet multiplied by the number of revolutions per minute, and divide by 33,000.

*EXAMPLE.—Required the horse power of a steam engine with cylinder 12 inches diameter, length of stroke 2 feet; number of revolutions per minute 80; average effective pressure on the piston 33 lbs. per square inch.

$$\text{Then } \frac{12 \times 12 \times \cdot 7854 \times 33 - 3 \times 2 \times 2 \times 80}{33{,}000} = 32 \cdot 9 \text{ horse power.}$$

RANSOMES, SIMS & JEFFERIES LIMITED have for many years devoted their attention to the manufacture of Portable and other Steam Engines.

The following are some of the leading features of their Portable Steam Engines.

SIMPLICITY of design and construction.

EXCELLENCE of materials and workmanship.

THE BRACKETS for supporting the crank-shaft bearings are of wrought-iron, rivetted to the boiler. The brasses on the crank side have a lateral adjustment, and those on the fly-wheel side a vertical adjustment, so that the crank-shaft is always kept perfectly level.

STAY ROD.—The plummer block on the crank side is connected to the cylinder by a strong wrought-iron stay, which forms a rigid connection in the direct line of thrust; suitable arrangement is made for expansion.

THE CYLINDER IS OF LARGE DIAMETER, and protected from cold, and consequent condensation of steam and loss of heat, by means of a jacket, which completely envelops it; it is further protected by wood and sheet-iron lagging.

CRANK-SHAFT. The crank-shaft is of large diameter, and has the crank or dip on one side close up to the bearing, the thrust being thus well supported. The crank-shaft is of sufficient length to take a fly-wheel or pulley at either or both ends.

GOVERNOR.—The governor is of the high-speed class, with light balls, the range of which is regulated by a spring. The governor, which is in direct communication with a double-beat piston valve, has complete control over the engine.

CONNECTING ROD.—The connecting rod in the larger engines is provided with an improved strap and cottar adjustment at each end; the strap is bolted firmly to the connecting rod head, the brasses being adjusted by a cottar and fixed by a set screw. This adjustment has found much favour, and is more easy and safe in its management than any other.

REGULATOR OR STARTING VALVE. The regulator slide is made of brass, and very ready of access. In the larger engines the entire case is also made of brass.

REVERSING EXCENTRIC. On every engine the slide valve excentric sheave is so arranged that by a very simple alteration the engine can be made to run in either direction.

THE BOILER, which is of large dimensions, contains ample heating surface to insure the rapid formation of steam, and abundant space round the fire box and tubes for the free circulation of the water and for the removal of sediment. These boilers are manufactured of the best English plates, flanged and rivetted by hydraulic machinery, which is much superior to hand-rivetting.

THE FIRE BOX has a raised top, giving increased steam space; it is made with a specially large grate area, to burn not only coal, but also any kind of ordinary firewood. For burning large logs, peat, sawdust, and other inferior fuel, the fire-boxes are made of extra large dimensions, at a slightly increased cost.

ECONOMY OF FUEL AND STEAM. The heating surface is so proportioned that the fuel will perform its utmost duty, and the steam is used so economically that no more water is evaporated than actually necessary to produce the force developed.

CONTINUOUS FEED PUMP, with return pipe, which, being always in action when the engine is running, is not likely to get out of order. These pumps are not liable to choke, nor to freeze in cold weather. The valves and seatings are all made of brass, and the covers of the valve chambers are so arranged that they can be easily taken off and replaced without the use of red lead.

A SIMPLE HEATING APPARATUS is supplied with every engine in connection with the feed pump, by means of which a portion of the exhaust steam is conveyed into the feed-water, which is thus heated and introduced into the boiler at a high temperature.

A Steam Blast is fitted into the chimney, by which the draught can be increased, and steam raised very quickly.

Link Motion Reversing Gear can be readily applied whenever required, as for engines to be used in Steam Ploughing, Winding, etc. It is of the best and newest construction, and the Engine may be reversed with the greatest facility.

The Wheels are made of wrought iron, the axles are strong, and the fore-carriage is furnished with a ball and socket joint locking gear, which enables the wheels to adapt themselves to the inequalities of the ground, so that whether travelling or at work, all cross strains are removed. Shafts or poles, for horses or oxen, are supplied according to the requirements of the country for which the engine is intended.

Brakes may be fitted to the hind wheels when required. They are extremely useful in all hilly countries.

Testing.—Every boiler is proved by hydraulic pressure to 160 lbs. per square inch, and the engines are thoroughly tried under steam, on the brake, before leaving the factory. They may be safely worked at a continuous pressure of 80 lbs., when they will give off about three times the nominal horse power.

Complete Equipment. All engines are sent out with steam pressure-gauge, glass water-gauge, two gauge cocks, steam whistle, safety-valve with spring-balance, second lock-up safety-valve, blow-off cock, steam jet to chimney, and arrangement for heating feed-water. They are also furnished with waterproof cover, tube brush, firing tools, shovel, set of spanners, oil-can, large funnel, spare gauge glass, and skid and chain, which are all included in the prices.

Durability and Facility of Repair. All wearing parts for engines of the same size and series are interchangeable; they have ample wearing surface, case-hardened wherever desirable. Duplicate parts can be had at any time by simply giving the number of the engine.

Chimney Lifter. Any of the engines may be fitted with a simple apparatus for raising and lowering the chimney.

Vertical Steam Engines and Boilers.

Vertical Engines can be strongly recommended for various purposes where a small power only is required. They occupy but little space, are very simple and compact, and can be set to work without any outlay for foundations or fixing; the prime cost is also less than that of almost any other class of steam engine.

The Boiler, which is of ample size, is made of best English plates, flanged and rivetted throughout by hydraulic machinery, and tested by hydraulic pressure to 160 lbs. per square inch. The boilers are intended for a continuous working pressure of 80 lbs.

The Fire Box is fitted with cross tubes, giving a large heating surface, and is adapted to burn any description of ordinary fuel.

The Engine is entirely independent of and separate from the boiler, the cylinder and working parts being arranged on a neat standard.

The Crank-Shaft is of ample strength, and will take a fly-wheel or pulley at either or both ends.

The Governors are direct acting, of the high-speed type, and very sensitive.

Link Motion Reversing Gear can be applied when desired.

A Feed Pump with treble brass valves and seatings is included with every engine. The pump is worked by an excentric from the crank-shaft.

The Chimney is of wrought iron, and can be made of any required length to pass through the roof of a building, or it can be arranged to turn into an ordinary brick flue, at a small additional cost.

Base Plate. The Engine and Boiler are mounted on a strong cast-iron bed plate, forming an ash-pan and also a tank for the feed water, which is heated by a portion of the exhaust steam, thus considerably reducing the consumption of fuel.

Every Engine is thoroughly tried under steam before leaving the works, and fitted with steam gauge, glass water-gauge, gauge cocks, blow-off cock, and double safety-valve, and furnished with firing tools and all usual accessories. They are made in nine sizes.

Vertical Steam Engines and Boilers.

RANSOMES, SIMS & JEFFERIES Limited, were awarded

GOLD MEDAL,

For their ENGINES and THRASHERS at the MELBOURNE EXHIBITION, 1880-81.
FIRST PRIZE and SPECIAL MENTION, EXHIBITION, 1888-89.

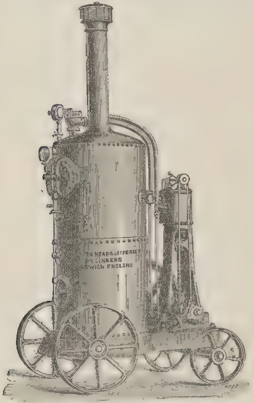


Fig. 56.

Sole Agents: JOHN DANKS & SON LIMITED.

391 Bourke St., Melbourne; 363 Pitt St., Sydney.

Long Stroke Stationary Engines.

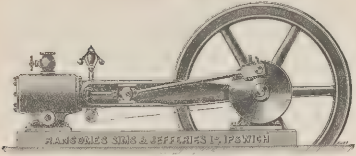


Fig. 57.

Sole Agents: JOHN DANKS & SON LIMITED.

The above engraving represents a new Long Stroke Expansion Stationary Steam Engine, designed by Ransomes, Sims & Jefferies Limited, which will be found to present many special advantages.

THE MAIN PLUMMER BLOCK and all the other parts of the engine are arranged to be interchangeable for either hand, so that R. S. & J. can readily alter any engine in stock to right or left hand as required.

The drawing shows a right-hand engine, which is always sent when not otherwise ordered.

THE MAIN FRAME is in one casting, of the circular hollow type, which, while lighter than the ordinary cast-iron foundation plate, is considerably stronger, being in a direct line with the throw or thrust of the engine.

THE CRANK-SHAFT is of steel or best hammered scrap-iron; the crank is of the disc type, accurately turned, bored and balanced, and securely fixed to crank-shaft. The crank-pin is of steel, rivetted into the disc.

THE ENGINE may be supported upon separate pillars under the cylinder and crank-shaft bearings, or a continuous bed may be provided if preferred.

THE CYLINDER, which is of large diameter, with a long proportioned stroke, is steam jacketted, the whole lagged and cased with sheet-iron.

THE GUIDE BARS are formed by the main frame casting, which is bored out true, the guide block being circular and so arranged that the wear may be easily taken up at either top or bottom as required.

THE CONNECTING ROD is of best hammered scrap iron, with wide gun-metal brasses, and suitable adjustments at each end.

THE FLY-WHEEL is of large proportions, and accurately balanced.

THE GOVERNORS are of the quick speed type, acting upon an equilibrium piston valve, very sensitive, and control the movement of the engine with great accuracy.

EXPANSION VALVES are always fitted to these engines in addition to the main slide valve.

PATENT AUTOMATIC EXPANSION, controlled by the governor, can be supplied instead of the ordinary expansion. By this arrangement the exact amount of steam is admitted into the cylinder in proportion to the load on the engine, which effects a further economy in fuel and ensures great regularity in speed.

EXCENTRICS AND SLIDES. The slide valve excentrics are arranged so that the engine can be readily set to run in either direction. When not otherwise ordered, these engines are always sent out so that the top of the fly-wheel revolves *from* the cylinder.

FEED PUMP. A feed pump with brass valves and seatings worked by an excentric from crank-shaft, is included in the price of these engines.

COUPLED ENGINES.—These engines may be arranged in pairs, both cylinders working on to one common crank-shaft, with the fly-wheel between them.

BOILERS.—Steam may be supplied by Cornish, Lancashire, Multitubular, or any other class of boiler preferred.

Winding Machinery.

System No. 1. With Semi-Portable Steam Engine.
System No. 2. With Semi-Fixed Under-type Engine.

Ransomes, Sims & Jefferies Ltd.

DANKS & SON LIMITED,
SOLE AGENTS.

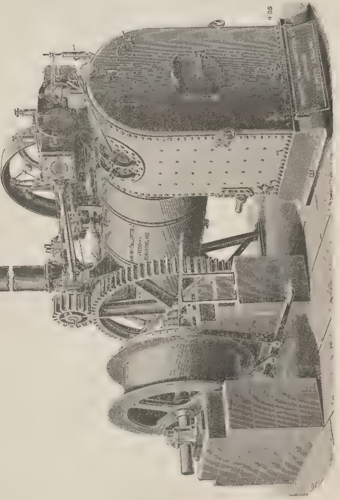


Fig. 58.

The following descriptions will apply to Systems No. 1 and No. 2, the winding gear being the same in both cases. The only difference is in the type of engine employed :—

THE ENGINE is fitted with link motion reversing gear of best construction, turned fly-wheel, continuous action feed pump, an arrangement for heating feed-water, improved governors, and all usual fittings complete. The cylinders are jacketted, and of large diameter; all the working parts are of great strength, with wide bearings.

THE BOILER, of the locomotive tubular class, is the most economical in fuel that can be obtained; it is lagged with wood, and neatly cased with sheet-iron

THE FIRE-BOX is of ample capacity for burning wood as well as coal; for burning wood, refuse, chips, dried dung, or any other kind of inferior fuel, it is made of extra large dimensions at a slightly increased cost.

AN INJECTOR, or Donkey Pump, if desired, can be attached to the boiler in addition to the usual feed pump.

THE WINDING DRUMS, carried on a strong wrought-iron shaft, are each 6 ft. diam. and 12 in. wide, and provided with a hard wood bed for the ropes to coil on. One of the drums is keyed on the shaft, and the other is attached to it by a pin, thus allowing the drums to be easily disengaged for winding or unwinding the ropes to suit various depths of shaft. The drums are driven by a spur pinion on engine crank-shaft, working into a large spur wheel fixed on the drum-shaft A strong brake is fitted to the inner or fixed drum. The levers of the steam valve, reversing gear, and brake, are all placed close together, so that the driver can attend to the engine and also to the hoisting and winding with the greatest facility.

A DIAL INDICATOR in connection with the winding drum enables the engineer in charge to see at any time the exact position of the cage or truck.

PUMPING GEAR For working a pump, a crank arranged for different strokes is fitted to the end of the winding drum shaft, and the motion is conveyed to the pump by means of a long connecting rod attached to a bell crank over the shaft of the mine.

SINGLE DRUM GEAR. In some cases a single drum is preferred, to be worked by engines which have to run in one direction only. The drum is then fitted with a clutch disengaging gear, so that after the load is hauled to the top of the shaft or incline, the drum can be disengaged without stopping the engine, and the empty truck or cage lowered by the brake.

PARTICULARS WHICH APPLY TO WINDING GEARS,
SYSTEMS 1 AND 2.

NOMINAL HORSE POWER	10	12	14	16	20
Gross load raised at 6 ft. per second ..	20 cwt.	24 cwt.	28 cwt.	32 cwt.	40 cwt.
Weight of Gear, packed approx.	98 ,,	98 ,,	98 ,,	98 ,,	98 ,,
Measurement, packed ,, ..	310 cubic ft.	310 cubic ft.	310 cubic ft.	310 cubic ft.	310 cubic ft.
Weight of Engine, nett ,, .	87 cwt.	95 cwt.	102 cwt.	135 cwt.	168 cwt.
,, ,, packed ,, ..	109 ,,	114 ,,	124 ,,	155 ,,	198 ,,
Measurement ,, ,, ,, .	405 cubic ft.	460 cubic ft	530 cubic ft	670 cubic ft	815 cubic ft

These Gears may be arranged for hauling heavier loads at less speed, or for lighter loads at higher speed.

NEAL'S PATENT STEAM SAW IN OPERATION.

Fig. 59.

Neal's Patent Steam Saw.

This Steam Saw has many advantages over those hitherto in use. With the old class of machine, it was impossible to cut more than in one direction; so that if a saw miller, squatter, farmer, or selector had decided to use this class of machinery at all, he was obliged to get at least two machines to do the work which is now accomplished by the above-named saw. Neal's Patent Steam Saw has also the advantage of being inexpensive, and also of simple construction.

With the one machine a person may go out into the thickly timbered country, and first cut down the trees, then saw them on the ground into slabs or suitable lengths for firewood; as much work being accomplished, if absolutely necessary, by one man in a few minutes as may be accomplished by ordinary sawyers in a day.

The machine when cutting up logs works automatically, requiring no attention until through the cut, thus leaving one man free to fire up the boiler, or help to split blocks. It will not knock when through the cut, even if full steam is on. It is easily worked, and can be managed by an inexperienced hand in a few minutes.

The machine is fitted on a strong undercarriage upon wheels, with an ordinary long T handle from the front, so that it may easily be removed from one place to another, either by tying the handle to the back of a cart, or, if for a short distance, by the man in charge pulling it, the whole weight of the machine not being an extremely heavy load for a man.

This machine is no inventor's fancy fad which will give the purchaser endless trouble, and eventually be thrown aside as useless. It is a thoroughly practical machine, and has been doing good work for the past twelve months.

It is made so as to stand the rough usage necessary; but, of course, like all other machines, is none the worse, and a great deal the better, for ordinary fair play and careful handling. It does not swallow up a great deal of steam, and thus a comparatively small boiler is sufficient to supply the necessary steam.

This machine will, undoubtedly, be a great boon to many of our squatters, farmers and selectors, as well as to the saw-millers, for what would otherwise be burnt and destroyed as useless and unmanageable may be made into a marketable article, and a source of income not at all to be despised. The sight of our giants of the forest in full blaze, for no better reason than to get them out of the way, should be a thing of the past; and instead of it we should see neatly-stacked piles of firewood, or sleepers, ready to be sent to market at a time when the best price may be obtained, or when teams are available to remove it to the nearest railway station, or other means of transport. The one machine will saw either upwards, downwards, or at any angle desired, and, as far as the machine itself is concerned, may easily be managed by one man.

The machine was greatly admired at the Melbourne Agricultural Show of 1888 and 1889.

Travelling Chaff-Cutter,

WITH BAG-FILLER AND ALL THE LATEST IMPROVEMENTS.

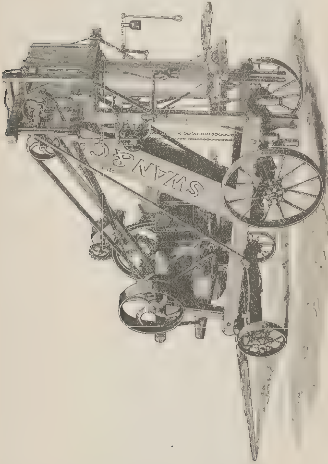


Fig. 60.

PRICE - £100.

JOHN DANKS & SON LIMITED, Agents.

391 Bourke St., Melbourne; 363 Pitt St., Sydney.

SWAN & CO., in bringing their Travelling Chaff-Cutter (with Bag-Filler combined) under the notice of farmers and others, beg to state that no effort has been spared in order to make the machine as nearly perfect as possible. By glancing at the illustration it will be noticed that the travelling wheels are wrought iron, these being far more durable than wood, and doing away with the necessity of having the tyres cut. The front wheels are constructed so as to turn under the frame, which prevents any possibility of the machine tipping over, and is a great convenience when bringing the machine close to a stack where room is limited. A spout is placed opposite to the cutting face to receive all the short chaff which flies from the knives, the same being conveyed to the receiver under riddle, and from thence to the Bag-Filler. By this means the riddle is relieved of fully one-third of the total amount of chaff cut by the machine, and allows it to make a first-class sample, without any fear of getting choked. Bags of different sizes are filled to a uniform height, and the amount put into each bag can be regulated by simply moving the weight on break-arm. The filler is started by pulling a string, and when the bag is full, is stopped by its own action. The frame and undercarriage are made of blackwood, and all parts of the machine are firmly stayed.

The following gentlemen, who are using these machines, bear testimony to the splendid manner in which they do their work :—

MR. JAMES DICK, Bunbartha, *via* Tallygaroopna.
,, HENRY PARKINSON, Mailor's Flat, near Warrnambool.
MESSRS. H. PILLOW & CO., Yarroweyeh.
MR. J. C. DAVEY, Boort.
,, JOHN BREWER, Merrigum.
MESSRS. CAMPBELL & FELTON, Murray Downs.
MR. JAMES SCOTT, Milloo.
,, THOMAS SLOAN, Pyramid Hill.
,, JOHN SLOAN, Pyramid Hill.
,, CHARLES WIDDIS, Traralgon.
,, JAMES HEEPS, Elmore.
,, THOMAS WESTON, Guildford.
,, WM. SELLWOOD, North Mooroopna.
MESSRS. J. & J. CUMMING, Bridgewater-on-Loddon.
,, BASSETT & COLES, Sebastian.
,, KEAST & SON, Newstead.
MR. JOSEPH HAMPTON, Goornong.
,, JOHN BRIGGS, Woodstock-on-Loddon.
MESSRS. JOHN & HENRY EVANS, Toolamba West.
MR. JOHN BEAMISH, Werribee.
,, HENRY KENTISH, Pyramid Hill.

The "Kilburn" Wire Strainer

(As supplied to the Victorian Railway Commissioners, the last contract being for 50,000),

SELF-CATCHING AND PERMANENT.

JOHN DANKS & SON LIMITED, Agents.

The Cheapest, Lightest, Simplest, Most Effective Wire Strainer ever produced.

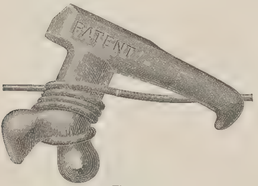


Fig. 61.

Cheapest.—Note prices quoted below, and compare with prices of other strainers.

Lightest.—Weight only 8 ozs. The cost of freight is, therefore, reduced to a minimum, and fence repairers may carry a considerable number without inconvenience.

Simplest.—The Strainer is formed in one solid piece, and has no loose pins, pawls, or fastenings of any description. There is absolutely nothing to wear out or get out of order. It is self-catching. The tension of the wire is secured and maintained by means of the retaining finger (which is one of the principal features of the invention) catching upon the wire itself, and rendering it impossible for the strainer to unwind.

Most Effective. The Strainer can be applied instantaneously. Five wires can be strained in less than half that number of minutes. It is attached to the wire between the posts, and turned like an augur by means of a small key.

It is equally adapted to either new or old fences, and when applied to the latter the necessity of unloosing or cutting and splicing the wire is entirely obviated.

Barbed wire can be strained as readily as plain wire, without the cutting and splicing inseparable from the employment of other strainers for the purpose.

ECONOMY IN COST OF FENCING.—A great saving in the first cost of fencing can be effected by the use of these Patent Strainers, because the usual straining posts may practically be dispensed with. The Kilburn Strainers are not fixed upon straining posts, but are attached to the wire between the ordinary posts; therefore, no matter what may be the length of a fence no straining posts are required, except at the extreme ends or at gate posts, if openings in the fence be needed. The wire is connected in one continuous length, and the Strainers are simply applied to it at intervals of ten to twenty chains, according to gauge of wire used. In the event of a wire breaking, sufficient wire will be found coiled around the nearest strainer to effect a splice.

Price of Strainers—3s. 6d. per dozen. Reduction for quantities.

Steel Keys, 2s. each (one key is sufficient for any number of Strainers).

ECONOMY IN MAINTENANCE.—Although the economy in first cost of fencing is shown to be very considerable, the saving effected in maintenance is of far greater moment. By the aid of the Kilburn Strainer a boundary rider can keep ten times the length of fencing in perfect order as compared with the old method of straining.

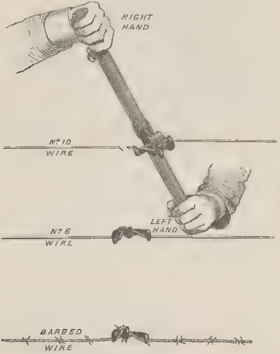


Fig. 62.

Instructions for Applying the Kilburn Strainer

1st.—Place the flat end of the Strainer between the jaws of the key, taking care that the projection on one of the jaws fits into the corresponding groove in the Strainer, and give it a slight tap on the nearest post, so that the Strainer may be secured in the key.

2nd.—Apply the Strainer to the wire, which should lie in the opening between the two claws or hooks. Now turn the Strainer by means of the wooden handle and key from left to right. Always commence with the right hand at the top, as shown in the above diagram, and grip the handle firmly. Take only half a turn, then give the Strainer a slight canting motion, so that the hook on the end of the retaining finger catches upon the wire, as shown in the engraving. Now change hands (but do not remove the key), and commence winding again with the right hand at the top, catching every half-turn until the wire is sufficiently tight.

3rd.—Be careful to wind the wire perfectly straight and evenly on the Strainer Turn slowly and in one continuous direction, *and always maintain a firm grip on the handle.*

A few only of the very numerous Testimonials received are appended—

APPLIED TO NEW FENCING.

Chaffey Bros., Australian Irrigation Colonies.

"We have now erected a considerable length of fencing with the Kilburn Strainers, and have decided to use them on all our fencing, as we consider them the best Strainers extant."

Joseph Mack, Esq., "Berry Bank," Lismore.

"I have used about 800 patent Kilburn Strainers, and am very much pleased with them. Any novice can use them. They effect a saving in straining posts, wire, and time. Without hurrying, I strained fifteen wires in less than five minutes. A man and a boy strained four and a half miles of old fence in three-quarters of a day. I have tried several patent strainers, but prefer the Kilburn to any I have seen, and can with confidence recommend them. I will send another order shortly."

Joseph Donaldson, Esq., "Mount Margaret," Queensland.

"I have used the Kilburn Strainers since they came out, and must say I prefer them to any other strainer in the market. I have shown the Strainer to several other station owners, and they are all greatly taken with it, because of its being so easily worked, and also on account of its lightness, which is an important consideration in this district."

APPLIED TO OLD FENCING.

Messrs. W. & J. Moodie, "Wando Dale," Victoria.

"We are very well satisfied with the Kilburn Strainer as being the best we have ever seen for tightening up old fences. Several gentlemen to whom we have shown the Strainer were also highly pleased with it."

T. F. Anderson & Co., "Chillichill," New South Wales.

"We consider Kilburn's Strainer superior to any other for repairing old fences, but have not yet had an opportunity of testing it upon new fencing."

INJECTORS AND STEAM FITTINGS.

Exhaust Steam Injectors.

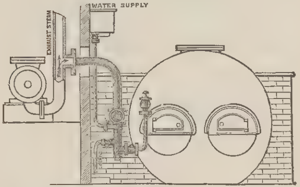


Fig. 63.

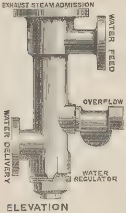


Fig. 64.

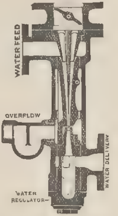


Fig. 65.

Exhaust Steam Injectors.

To supply hot water to steam boilers, and utilising the exhaust steam of the engine for that purpose. These Injectors work with the exhaust steam only from the engine No steam being taken from the boiler, the saving is obvious. No throttling of the exhaust pipe of the engine is necessary; on the contrary, back pressure in the cylinder is reduced. No pump or feed-water heater is required. They are made on Hamer Metcalf & Davies' (of England) patent, for whom we are the licensees. We make these in fourteen sizes, No. 2 to No. 15. They take the steam from the exhaust pipe without any throttling, and, acting on the cold water through jets, inject the water into the boiler at 180 degrees Fahr. By utilising the waste steam and imparting its heat to the water, a saving of fuel to the extent of 10 per cent. or more is obtained; also, by injecting the water into the boiler at a high temperature reduces the strains due to unequal expansion where cold water is used, which is always a less source of trouble. These Injectors feed the water to a pressure of 75 lbs. per square inch.

These Injectors have a live steam supply in case the engine is standing, and are fitted with throttle valve and connecting flanges to make steam and water connections.

INSTRUCTIONS FOR FIXING.

POSITION.—The Patent Exhaust Injector should be fixed *vertically*, sufficient space being left below it to admit of the withdrawal of the nozzle.

EXHAUST STEAM. It is desirable to fix the Injector as near the cylinder as circumstances will allow, and to connect it with the *top or side* of the exhaust pipe in such a way as to catch as little water as possible. In the case of engines working for a few strokes only at a time, such as winding engines, the branch pipe *must be as short as possible*, in order that the Injector may start with the first stroke of the engine. A throttle valve to shut off the steam is placed on the Injector; this valve is not required for winding engines. Pressure not to exceed 65 lbs.

NOTE *Great care must be taken that all joints between the cylinder and Injector are perfectly air-tight, and that no inlet for air exists.*

WATER.—The feed-water must be taken from a level above the Injector, and its temperature should not exceed 85° Fahr. A cock should be placed on the water pipe to prevent waste when the Injector is stopped. The inlet to the water pipe in the tank must be protected against dirt, etc., by a large but fine mesh sieve.

OVERFLOW.—The overflow pipe is to be screwed into the syphon attached to the overflow branch, and must be led *downwards*.

NOTE.—If Injector when working draws in air at overflow, the end of the pipe should be arranged to dip about ½in. under water, or a light back pressure valve may be attached in order to keep out the air.

DELIVERY.—There must be the usual clack box or back-pressure valve on the boiler, as well as the check valve near the Injector.

JOINTS should not be made with white or red lead.

DIAMETER OF PIPES. -The pipes must not be less in diameter internally than shown in the table below. Sharp bends should be avoided, and before connecting the Injector both steam and water pipes should be thoroughly cleared out.

INSTRUCTIONS FOR WORKING.

STARTING.—*To start the Injector*, all that is necessary is—*To open the throttle valve, admitting the exhaust steam*, and to *open the water cock*. Should the engine stop, re-starting it will re-start the Injector, *no manipulation being required*.

REGULATION.—The index for the water regulator is the graduated collar at the bottom of the Injector, the extreme points of which are lettered M and H. When the centre of the collar is opposite the *end of the pointer* it is in a good position for working. If not supplying sufficient water, *turn the large nut round* (by means of an ordinary screw-key), so that the letter M is nearer the pointer; but if less water is required, bring the letter H towards it. The nearer this letter is to the pointer the hotter is the water delivered, and, of course, the greater the economy. If the regulator is turned too far in either direction it will cause overflow.

When there is a considerable head of water, the cock will require adjusting. The table below gives the *mean* delivery for each size.

NOTE.—To insure that the regulator may at all times be easily moved, it should be turned round occasionally. Should it become necessary to remove any dirt, etc., from the inside, the nozzle may be withdrawn (without breaking any joints) by simply unscrewing the same nut as used for regulating. Before it is put back the bearings must be cleaned, care being taken not to injure the nozzle, and to restore it to its proper position as shown by the pointer.

TO WORK THE INJECTOR WHEN ENGINE IS STANDING.—Connect a pipe from boiler (of same diameter as water pipes) to boss on throttle valve, and at a convenient part of it, fix a wheel valve (E) in order to regulate the steam.

TO START. –Open the water, then *gradually* turn on boiler steam until Injector works dry, after which *turn no more on*.

Size.	Delivery in Gallons per Hour.	Inside Diameter of Pipes. Exhaust.	Water Pipes	Overflow	Size.	Delivery in Gallons per Hour	Inside Diameter of Pipes. Exhaust.	Water Pipes.	Overflow.
2	60	1 in.	½ in.	⅜ in.	9	1,200	4 in.	1¾ in.	1¾ in.
3	150	1¼ in.	¾ in.	½ in.	10	1,510	4½ in.	2 in.	2 in.
4	240	1¾ in.	1 in.	¾ in.	11	1,790	5 in.	2 in.	2 in.
5	380	2¼ in.	1 in.	1 in.	12	2,170	5¼ in.	2¼ in.	2¼ in.
6	540	2½ in.	1¼ in.	1¼ in.	13	2,500	5½ in.	2½ in.	2½ in.
7	740	3 in.	1¼ in.	1¼ in.	14	2,900	6 in.	2½ in.	2½ in.
8	950	3½ in.	1½ in.	1½ in.	15	3,300	6½ in.	2¾ in.	2¾ in.

Compound Exhaust and Live Steam Injector.

SAVES COAL! SAVES MONEY!

REDUCES BACK PRESSURE IN CYLINDER!

PREVENTS UNEQUAL EXPANSION IN BOILERS!

These are the most recent patent of Hamer Metcalf and Davies, and for which we are licensees.

We make these in sizes No. 2 to No. 12. The difference between these and the Exhaust Steam Injector is that they will supply a water pressure of 105 lbs. per square inch.

The principle on which they act is, when the exhaust steam has heated the water and given it a velocity or pressure as shown in the ordinary Exhaust Injector, a jet of live steam is forced into the jet as it is forming, and imparts the increased pressure as described, and can therefore be used with boiler carrying a higher pressure than ordinary. The economy is practically the same as if exhaust steam only was used, as the live steam taken from the boiler not only gives the feed-water the additional speed or pressure, but raises its temperature to about 170° to 180° Fahr. By the application of these Injectors the steaming power of boilers is greatly increased, the effect being equal to the addition of at least one-eighth to the heating surface, thus producing an ample supply of steam without heavy firing. It may also be arranged to feed the boiler, when the engine is standing, by connecting another live steam pipe to the valve at the top of Injector in place filled up by screwed plug.

These Injectors were fitted on the standing electric-light engine at the Centennial Exhibition, and worked admirably. They are also working with great success on steamers, tugs, dredges, etc., as they work well in the roughest weather; and the economy in fuel shown over the ordinary Live Steam Injector has never been found less than 20 per cent. in actual practice.

Compound Exhaust and Live Steam Injector

FOR WORKING AT PRESSURE UP TO 105 LBS. PER SQUARE INCH

(7 Atmospheres).

Size of Injector.	Delivery in Gallons per Hour.	Inside Diameter of Pipes. Branch from Exhaust	Water Pipes.	Over-flow.	Live Steam from Boiler.	Size of Injector.	Delivery in Gallons per Hour.	Inside Diameter of Pipes. Branch from Exhaust	Water Pipes	Over-flow.	Live Steam from Boiler.
2	60	1 in.	$\frac{1}{2}$ in.	$\frac{1}{2}$ in.	$\frac{1}{4}$ in.	8	1,050	$3\frac{1}{2}$ in.	$1\frac{1}{2}$ in.	$1\frac{1}{2}$ in.	1
3	150	$1\frac{1}{2}$ in.	$\frac{3}{4}$ in.	$\frac{1}{2}$ in.	$\frac{3}{8}$ in.	9	1,370	4 in.	$1\frac{1}{2}$ in.	$1\frac{1}{2}$ in.	1
4	270	2 in.	1 in.	$\frac{3}{4}$ in.	$\frac{3}{8}$ in.	10	1,700	$4\frac{1}{2}$ in.	2 in.	2 in.	$1\frac{1}{4}$
5	420	2 in.	1 in.	1 in.	$\frac{1}{2}$ in.	11	2,050	5 in.	2 in.	2 in.	$1\frac{1}{4}$
6	600	$2\frac{1}{2}$ in.	$1\frac{1}{4}$ in.	$1\frac{1}{4}$ in.	$\frac{3}{4}$ in.	12	2,450	$5\frac{1}{2}$ in.	$2\frac{1}{2}$ in.	2 in.	$1\frac{1}{2}$
7	830	3 in.	$1\frac{1}{4}$ in.	$1\frac{1}{4}$ in.	$\frac{3}{4}$ in.	13					

Gresham's Improved Giffard's Injector,

FOR SUPPLYING STATIONARY, LOCOMOTIVE, AGRICULTURAL, OR MARINE STEAM BOILERS WITH WATER.

These Injectors possess great advantages over all injectors hitherto introduced for simplicity of construction and manipulation; any unskilled person may become perfectly acquainted with their arrangement and management in a few minutes.

These Injectors are all fitted with connecting flanges, thereby making a neater job when fitted up.

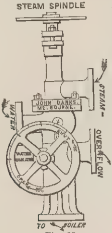


Fig. 66.

ADVANTAGES POSSESSED BY INJECTORS AS BOILER FEEDERS OVER PUMPS OF ANY DESCRIPTION.

1. The first cost is far less than that of any pump; and having no parts in motion the repairs are reduced to a minimum.

2. They are entirely separate from the engine, and are independent of it, being an adjunct to the boiler.

3. The steam employed in working the Injector is returned to the boiler with the feed water, thereby raising its temperature, and preventing the unequal expansion so disastrous to boiler plates, caused by pumping in water at a low temperature.

4. The supply water (through the Injector) enters the boiler in a continuous stream, in place of the intermittent action caused by all pumps.

SPECIAL ADVANTAGES CLAIMED FOR THE GRESHAM INJECTOR.

1. Extreme simplicity of construction.
2. Internal packing is entirely dispensed with.
3. The graduated index on the water regulator at once shows the attendant the required adjustment, and thus prevents the possibility of error.
4. The bursting of the nozzles is prevented by a valve on the steam spindle.
5. These Injectors will work equally well at any pressure, having self-contained steam and water adjustment.

These Injectors are all carefully tested with steam before leaving the works.

GENERAL INSTRUCTIONS FOR FIXING INJECTORS.

1. The pipes connecting the Injector to the boiler should be the diameter mentioned in the above table.

2. Injectors may be placed either above or below the water supply; if above, the distance must not exceed, for No. 2 size Injector, 2 feet; No. 3 Injector, 3 feet; No. 4 Injector, 4 feet; and so on, up to 12 feet.

3. Injectors can be fixed either vertically or horizontally.

4. The nut of the water-regulating wheel must be kept moderately tight, to prevent the possibility of the wheel being accidentally moved from its proper position.

5. The water supply pipe should have a rose attached to the end of it. *Be sure that this pipe is perfectly air tight.*

For the efficient working of an Injector a supply of dry steam is a necessity; also a continuous water supply, which must not exceed 150 deg. Fahrenheit. A back-pressure valve must be placed on the delivery pipe, between the Injector and the boiler; also a wheel valve or cock on the steam pipe.

General Instructions for Working Injectors.

1. Open the valves and cocks connecting the Injector with the boiler.

2. Open the water supply by means of the graduated hand-wheel to the extent required for the steam pressure in the boiler.

3. Open the steam spindle *slightly* until water issues freely from the overflow pipe; then open up the steam spindle to the full extent. If water continues to issue from the overflow pipe, regulate the water supply by means of the graduated hand-wheel.

The amount of feed water supplied to the boiler through the Injector may be increased or decreased at pleasure by opening or closing the steam spindle and graduated hand-wheel.

Rule for finding the Number of Gallons these Injectors will supply.

To the nominal horse power add a cypher on the right hand side, and read as the number of gallons delivered per hour.

No.	Price.	Internal Diameter of Pipes in inches.	lbs. 10	lbs. 20	lbs. 30	lbs. 40	lbs. 50	lbs. 60	lbs. 70	lbs. 80	lbs. 90	lbs. 100	lbs. 110	lbs. 120	lbs. 130	lbs. 140	lbs. 150
			Nominal Horse Power at the Above Pressures.														
2	[illegible] 4 0	½	2	3	4	5	5	6	6	7	7	8	8	8	9	9	9
3	[illegible] 2 [illegible]	¾	5	7	9	11	12	14	15	16	17	18	18	19	20	21	21
4	[illegible] 0	1	10	14	17	20	22	24	26	28	30	31	33	34	36	37	39
5	[illegible] 0	1	15	22	27	31	35	38	41	44	47	49	52	54	56	58	60
6	9 [illegible] 0	1¼	22	32	39	45	50	55	59	64	67	71	75	78	81	84	87
7	1[illegible] 0	1¼	34	43	53	61	68	75	82	87	92	97	102	106	111	115	119
8	[illegible]	1½	40	56	69	80	89	98	106	113	120	127	133	139	145	150	155

Danks' Simplex Non-Lifting Injector.

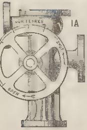


Fig. 67.

These have been made for a cheap and efficient constant Injector, having fixed nozzles, being exceedingly simple in operation, but requiring the water to be above them if not attached to water main.

Sizes—No. 2, 3, 4, 5, 6, 7, 8.

These have all gun metal flanges fitted to them ready for fixing, and have been tested under steam.

Boiler Test and Feed Pump.

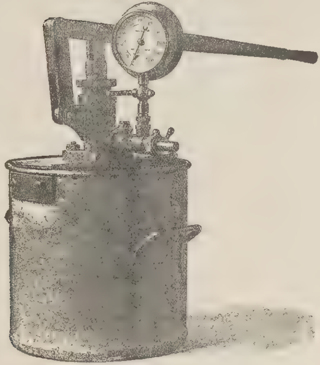


Fig. 68.

Boilers are now almost universally tested by hydraulic pressure in consequence of the danger attendant in the use of steam for such purposes. Owing to the non-elastic nature of water, there is no danger to be apprehended in the event of the boiler yielding to the hydraulic test The above illustration represents our improved Boiler Testing and Feed Pump, which has been constructed to supply a long-felt want amongst engineers and boiler-makers, who have hitherto found themselves seriously inconvenienced for the want of a reliable and effective boiler-testing apparatus The construction is exceedingly simple, all material being of first-class quality, the plunger fitted in a packed gland, with check valves, pressure gauge, and long iron lever, mounted on a strong galvanised iron tank, which makes it the most complete pump of the kind yet introduced for the use intended. We make them in two sizes, viz., 1½ in. and 2 in., and will test boilers up to 200 lbs. per square inch. They also serve as an auxiliary to a boiler in the shape of a feed pump, and have at times proved invaluable as such when pumps and other feeders have broken down or become temporarily disabled.

The Penberthy Injector.

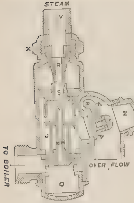


Fig. 69

V Tail Pipe.
X Tail Nut.
R Steam Jet.
S Suction Jet.
Y Delivery Tube.
U Delivery Sleeve.
T Ring
O Plug
Z Overflow Cap
P Overflow Valve.
N Overflow Hinge.

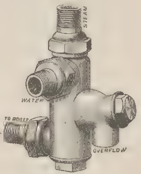


Fig. 70.

DIRECTIONS FOR CONNECTING.

Every Injector has its peculiarities. Post yourself regarding ours.

B -Injector.
C—Steam Pipe.
D—Globe Valve.
E—Delivery Pipe.
F Check Valve.
G—Globe Valve.
H—Globe Valve.
I—Suction or Water Pipe.
J—Water or well.
K—Shows mode of connection in cases where top or dome of boiler cannot be tapped, pipe must then go in to highest point below dome
L—(Between dotted lines.) Pipe to Tank when water flows to Injector.
L—Pipe *to* carry waste water from overflow before injector gets started, and when it stops. Have it larger than overflow opening.

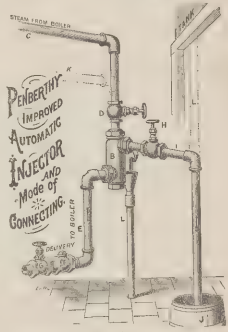


Fig. 71.

Globe Valve G is not necessary, but should be placed next to boiler in case of accident to Check Valve F, and should always remain open. All other valves are absolutely necessary. Length of pipe and conditions will vary according to circumstances, but the mode of connection must always be the same. *Have valves D and H as close to Injector as possible.*

Important.—In connecting to water works, tank, or any place where water *flows to Injector*, place Globe Valve H so that it closes *against the water pressure*, and see that there is no leak where pipe attaches to Injector, or in the valve H.

DIRECTIONS FOR CONNECTING AND OPERATING INJECTOR.

Be sure and blow out steam pipe thoroughly *before connecting Injector*, so as to remove any dirt, rust, or scale that may have accumulated in pipes. *This is important.*

Take steam from highest point of boiler possible, and never connect with any steam pipe used for other purposes.

If more than 10 feet of suction pipe are used, it should be a size larger than Injector fittings. Any of the pipes used can be larger, but in no event smaller. If water is forced through a heater there must be a *check valve* between heater and Injector to prevent back pressure. All connections *must be tight*, especially in suction pipe.

Don't use a wrench on tail pipes No. V. The hole in end next to Injector is made *square* for the purpose of inserting a chisel or piece of iron on which to use the wrench.

To clean Injector, unscrew Plug Cap No. O, and the removable jet will follow the plug out in which it rests. Turn on steam (not less than 40 lbs.), and all dirt will be blown out. Examine all passages, and see that no dirt or scale have lodged in them. Replace jet by *setting it in the plug* (which acts as a guide), and screw in to place tightly.

Be careful not to bruise any jets, and use no wrenches on body.

TO OPERATE.

Open water valve H, also steam valve D, as soon as water appears at overflow, throttle water until discharge ceases, when Injector will be working. On long lift or high steam it is sometimes necessary to open steam valve only part way until water appears; *then open full.*

Where water *flows to Injector*, open steam valve first, then water valve.

HINTS.

A hot suction pipe makes no difference in starting this Injector.

A leaky suction pipe will prevent any Injector from working, and nine times out of ten it is the *cause of all trouble*. To find leak take off overflow cap, and hold valve down firmly with *wooden lever*, open valve H, then valve D, and the steam will locate the leak as it blows back into suction pipe.

When valve H is set so that boiler is getting the required amount of water, do not disturb it in stopping and starting Injector; simply turn steam on and off, and it will restart automatically.

By opening of valve H, as far as it will stand without breaking feed to boiler, these Injectors will run, *without re-adjusting*, from 30 and 40 lbs. to 90 and 100 lbs.; and by throttling water very fine on high pressure, they will run down 60 to 75 lbs. without adjusting.

PENBERTHY INJECTOR CO.

JOHN DANKS & SON LIMITED, Sole Agents.

---

391 Bourke St., Melbourne; 363 Pitt St., Sydney.

The X-L Ejector, or Steam "Jet Pump."

Fig. 72.

LIFTS WATER 20 TO 25 FEET. ELEVATES 10 TO 30 FEET.
RELIABLE AND ECONOMICAL.
CAN BE PLACED HORIZONTAL OR PERPENDICULAR.

CAPACITY OF EJECTORS.

SIZE.	Steam Connection.	Delivery and Suction.	Capacity per hour.
XL No. 1	$\frac{3}{8}$	$\frac{1}{2}$	250
„ „ 2	$\frac{1}{2}$	$\frac{3}{4}$	500
„ „ 3	$\frac{3}{4}$	1	960
„ „ 4	1	$1\frac{1}{4}$	1,300
„ „ 5	1	$1\frac{1}{2}$	2,000
„ „ 6	$1\frac{1}{4}$	2	3,500
„ „ 7	$1\frac{1}{4}$	$2\frac{1}{2}$	5,000
„ „ 8	$1\frac{1}{2}$	3	8,000

In ordering state *size number* to avoid errors, which are liable to occur where pipe connection sizes are named. The capacity is based on a two to four-foot lift with 65 lbs. steam, which is a fair average pressure; a greater lift decreases the capacity in the same proportion as other Ejectors.

Will lift water 25 feet and elevate it from 10 to 30 feet above the instrument, according to steam pressure.

DIRECTIONS FOR CONNECTING.

See that all joints in water supply pipe from *Ejector to water are air-tight. Don't use a wrench* on the brass coupling, but insert a piece of iron or chisel in the end *(made square for that purpose)* and screw into place. On a lift of fifteen feet or over use a size larger suction pipe than connection, increasing size as near Injector as possible.

We recommend a Globe Valve in delivery pipe (although not absolutely necessary) in case you want to blow down water supply pipe to clean out.

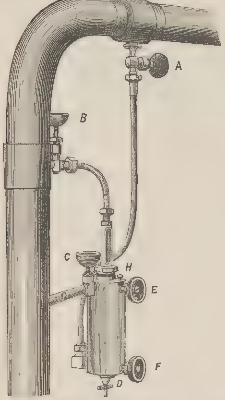


Fig. 73.

Sight Drop Lubricator.

A. and B.—Valves to cut off connection with steam pipe.

C.—Valve for filling oil into lubricator.

D.—Valve to let out water before refilling.

E.—Valve for regulating supply of oil to the engine.

F.—Supply of water to lubricator.

G.—Stay for fixing lubricator.

H.—Air vent to let out air when filling.

This Lubricator has been designed to enable engineers to regulate to a nicety the quantity of lubricant they wish to supply to their engines. As the oil goes up through the water in gauge glass a drop at a time, the engineer can find out how many drops to the minute his engine needs, and keep the oil flowing at the required rate By this means there is no waste, and the oil being entirely enclosed, no dirt can get into it. It has a great advantage over any other lubricator. We make them in three sizes, ½-pint, 1-pint, 1½-pint.

TO START LUBRICATOR.

See all valves are closed, take off cover C and remove air vent H, and fill Lubricator with oil, replace C and H, open valve A full and B slightly, and allow steam to condense till the glass is full of water, open valve F, and then slightly open valve E to allow drop of oil to flow up through glass tube. To refill, close E and F, and open E to draw water, and fill up as before.

See that Lubricator is always filled with lubricant, as air left in top of Lubricator prevents it starting.

The valves A and B can both be fixed on a vertical pipe, and A should be at least one foot higher than B.

Our Double Sight Drop Lubricators were fixed on each of the Electric-Light Engines at our late Exhibition, and gave every satisfaction, the one lubricator supplying both engines. The principle of their action is as with the Single Sight Drop Lubricator, the steam condensing in the copper tube forms water which flows into chamber of Lubricator, thereby displacing the lubricant, which flowing up through a glass tube full of water in small globules shows the quantity feeding each engine, and can be regulated as desired by a small valve.

Independent Lock-up Safety Valve.

At a meeting of the Institute of Engineers in 1876, presided over by Sir F. J. Bramwell, F.R.S., and the undermentioned six vice-presidents, viz., Sir Wm. Armstrong, C.B., D.C.L., L.L.D., F.R.S.; Sir Joseph Whitworth, Bart.; Sir C. W. Siemens, D.C.L., F.R.S.; Sir J. L. Bell, M.P.; John Penn Robert Napier, and over 1,500 members and Council, comprising the leading engineers of the world, agreed that Safety Valves for steam boilers *essentially* should be so constructed that the *force, resistance* and *motion* should all lie in the same direct line.

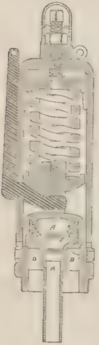


Fig. 74.

EXPLANATION OF SECTIONAL VIEW.

A. Steam pipe and receiver for the independent steam to lift the Valve when the pressure in boiler exceeds the limit desired. B. Passage for the steam to escape when the Valve rises. C. Accumulative area, exposing more surface to the boiler pressure, as the Valve rises.

In order that the *force, resistance* and *motion* should all lie in the same way, I have adopted the direct-acting pressure as shown in section. The necessity of an independent steam pressure, constantly pressing upwards irrespective of the steam escaping, has necessitated the insertion of a central pipe, forming a medium for the steam to press constantly on the Valve as shown. The advantages possessed by this Safety Valve above all others are—first, the steam that lifts the Valve does not escape, thereby forming a constant, and not a variable, upward pressure, as the escaping steam takes no part in lifting the Valve; secondly, after the Valve lifts it offers one-fifth *more area* to the boiler pressure, thoroughly releasing the boiler from undue pressure; third, the Valve can be lifted by the lever to blow off the boiler at any time desired, thoroughly guarding against sticking of Valve from priming or dirt; fourth, each Valve can be adjusted in one minute, giving a range of from 155lb. per square inch to 40lb.; fifth, each Valve has an indicator outside, showing the pressure on the spring; sixth, the steam in its passage to escape does not pass the spring; seventh, each spring is electro-plated, guarding against rust; eight, it is impossible to tamper with or in any way put more pressure on the Valve without taking off the lock; and finally, it is from its direct mechanical construction enabled to lift 100 per cent. higher than any other make of safety valve, thereby offering 100 per cent. more area for the steam to escape. This extensive area makes this Valve almost noiseless in blowing off.

Sole Makers: JOHN DANKS & SON LIMITED.

391 Bourke St., Melbourne; 363 Pitt St., Sydney.

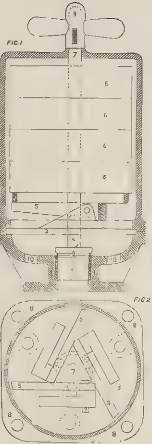


Fig. 75.

FULTON'S

Patent Multiplied Lever

AND

Locked Safety Valve.

This Valve is one square inch. The weight on the levers is 20 lbs., which gives 80 lbs. per square inch on the Valve.

This Valve, when steam is on, can be lifted or revolved; but no additional weight can be put on the Valve.

There are no springs used with this Valve.

All Valves are tested with steam before being sent out.

Numbers of these Valves are at work in Melbourne, giving every satisfaction.

JOHN DANKS & SON LIMITED, Makers.

391 Bourke St., Melbourne; 363 Pitt St., Sydney.

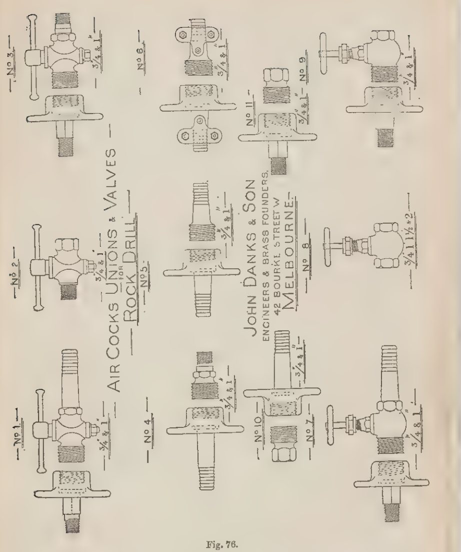
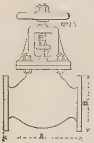


Fig. 76.

All of our Air Cocks, Valves, and Unions, are made of the best gun metal, and are specially strongly made so as to be well suited to the work required of them. We make special designs for special requirements; but the above are those most in use. In ordering, please state the figures given underneath as well as the number of the article.

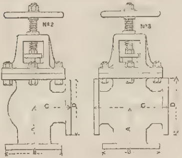
Cast-iron Steam and Safety Valves.



No 1.

STRAIGHT STEAM VALVES.

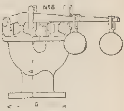
2½in	A = 7½in	B = 7in
3in	,, 10½in	8in
4in	,, 13½in	9½in
5in	,, 16in	11in
6in	,, 17in	12in



No. 2 and No. 3.

RIGHT ANGLE & THREE WAY VALVES.

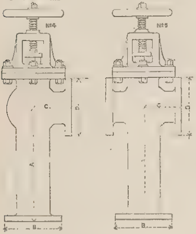
2½in	A = 4½in	B = 7in	C = 7in	D = 7in
3in	,, 5½in	,, 8½in	,, 5½in	,, 7½in
4in	,, 6½in	,, 9½in	,, 6in	,, 9½in
5in	,, 7½in	,, 10in	,, 6½in	,, 10in
6in	,, 8½in	,, 11in	,, 7½in	,, 13in



No. 8.

DOUBLE SAFETY VALVES.

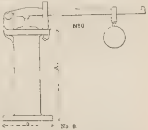
2½in	A = 9½in	B = 9in
3in	,, 10½in	,, 10in



No. 4 and No. 5.

RIGHT ANGLE & THREE WAY VALVES.

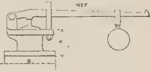
2½in	A = 12in	B = 7in	C = 7in	D = 7in
3in	,, 14in	,, 8½in	,, 5½in	,, 7½in
4in	,, 20in	,, 9½in	,, 6in	,, 8½in
5in	,, 20in	,, 10in	,, 6½in	10in
6in	,, 24in	,, 11½in	,, 7½in	,, 12in



No. 6.

LONG SAFETY VALVES.

2½in	A = 12in	B = 8in	4in	A = 16in	B = 10in
3in	,, 16in	,, 8½in	4½in	,, 18in	,, 10in
5in	A = 24in				B = 11½in



No. 7.

SHORT SAFETY VALVES.

2½in	A = 4in	B = 6½in
3in	4½in	,, 8in
4in	,, 4½in	,, 8in
3in	,, 5½in	,, 6½in

Iron Steam Stop and Safety Valves, with Gun Metal Spindles, and Valves. Articles on this Sheet in Stock or made at the shortest notice.

Alteration in size of flanges made to suit purchasers.

Fig. 77.

The above illustrations show the dimensions of our different styles of cast-iron Steam and Safety Valves. This page will, no doubt, prove very handy to many of our customers, as they may prepare other work in connection with the work for which the valves are required. In ordering from these illustrations please give the figure underneath, as well as the number of the article.

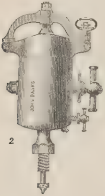


Fig. 78.

Wilson's Impermeator.

Fig. 80.

Ordinary Suet Lubricator.

1, 1¼, 1½, 1¾, 2, 2½, 3, 3½, 4 inch.

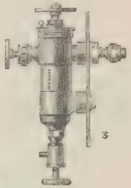


Fig. 79.

Roscoe's Lubricator,

As supplied to the Victorian Railways for their Locomotives.

Fig. 81.

Suet Lubricator,

With Displacement Cock.

1¼, 1½, 1¾, 2, 2½, 3, 3½, 4 inch.

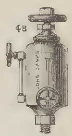


Fig. 82.

Suet Lubricator,

With Gauge Glass and Displacement Cock.

2, 2½, 3, 3½, 4 inch.

Our Steam Work has been awarded First Prizes Paris, Philadelphia, Amsterdam, Calcutta, Melbourne, Sydney, Adelaide, and Christchurch.

Fig. 83.

Oil Syphon.

¾, 1, 1¼, 1½, 1¾, 2, 2½, 3 inch.

Fig. 84.

Oil Syphon.

¾, 1, 1¼, 1½, 1¾, 2, 2½, 3 inch.

Fig. 85.

Oil Syphon.

¾, 1, 1¼, 1½, 2 inch.

Fig. 86.

Oil Syphon.

¾, 1, 1¼, 1½, 2 inch.

Fig. 87.

Havre Lubricator,

With Indicator and Glass Barrel.
1¼, 1½, 1¾, 2, 2½, 3 inch.

Fig. 88.

Fig. 89.

Glass Lubricators.

We keep these in all patterns, and have a very large stock always on hand.

These Oil Syphons may be screwed either for Gas or Whitworth threads.

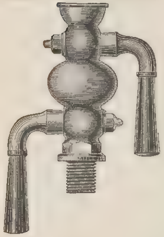


Fig. 90.

Ordinary Double Tallow Cup.

$\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3 inch.

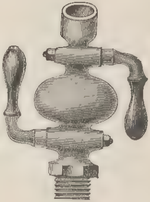


Fig. 91.

Double Tallow Cup,

With Deep Plug.

$\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3 inch.

Fig 92.

Steam Gauge.

We have a large stock of all sizes of Steam, Hydraulic, and Vacuum Gauges always on hand.

$2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4, $4\frac{1}{2}$, 5, 6, 7, 8 inch.

Fig 93.

Ordinary Steam Whistle,

With Valve and Lever.

Sizes, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, $1\frac{3}{4}$, 2, $2\frac{1}{2}$, 3, 4, 5, 6 inch.

Fig. 94.

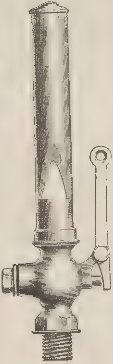


Fig. 96.

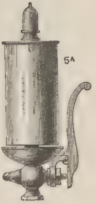


Fig. 95.

Ordinary Steam Whistle.

Sizes, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, $1\frac{3}{4}$, 2, $2\frac{1}{2}$, 3, 4, 5, 6 inch.

New Pattern Steam Whistle,

With Valve and Lever.

Sizes, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, $1\frac{3}{4}$, 2, $2\frac{1}{2}$, 3, 4, 5, 6 inch.

Steam Organ Whistle,

With Valve and Lever.

This is a first-class whistle for factories, sawmills, and general purposes; the larger sizes make good fire alarms.

Sizes, $1\frac{1}{4}$, $1\frac{1}{2}$, $1\frac{3}{4}$, 2, 2, $2\frac{1}{4}$, $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4, 5, 6 inch.

Larger sizes to order.

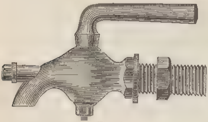


Fig. 97.

Bent Pet Cock,

Lever Handle and Clearing Pin.
$\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1 inch.

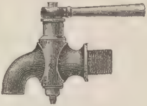


Fig. 98.

Bent Pet Cock,

With Deep Barrel, Lever Handle.
$\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ inch.

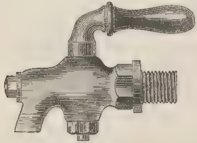


Fig. 99.

Strong Bent Pet Cock,

Lever Ebony Handle and Clearing Pin.
$\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1 inch.

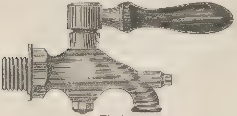


Fig. 100.

Light Bent Pet Cock,

Lever Ebony Handle and Clearing Pin.
$\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1 inch.

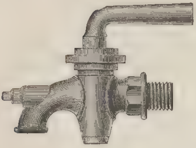


Fig. 101.

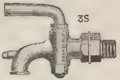


Fig. 102.

Bent Pet Cock,

Lever Handle, Packed Gland, and Clearing Pin.

$\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1 inch.

Deep Barrel Bent Pet Cock,

Lever Handle and Clearing Pin.

$\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ inch.

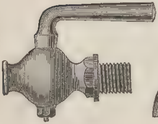


Fig. 103.

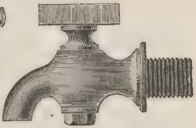


Fig. 104.

Straight Pet Cock.

$\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ inch.

Bent Pet Cock,

Tee Handle.

$\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$ inch.

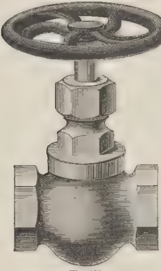


Fig. 105.

Screwed Steam Valve.

$\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.

Fig. 106.

Screwed Steam Valve.

$2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4 inch.

Fig. 107.

Flanged Steam Valve.

$\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4 inch.

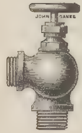


Fig. 108.

Right-angle Steam Valve.

Screwed Male.

½, ¾, 1, 1¼, 1½, 2, 2½, 3 inch.

Fig. 109.

Peet's Valve.

Flanged or Screwed.

½, ¾, 1, 1¼, 1½, 2, 2½, 3 inch.

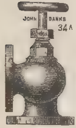


Fig. 110.

Right-angle Flange Steam Valve.

¾, 1, 1¼, 1½, 2, 2½, 3, 4 inch.

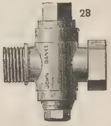


Fig. 111.

Deep Barrel Steam Cock.

¼, ⅜, ½, ¾, 1, 1¼, 1½, 2, 2½, 3, 3½, 4 inch.

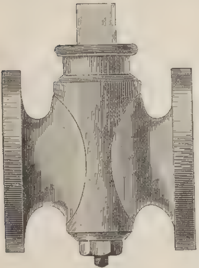


Fig. 112.

Plain Plug-flanged Cock.

$\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4 inch.

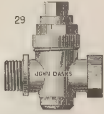


Fig. 113.

Cap-top Plug Steam Cock,

Male and Female

$\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4 inch.

We also make these Cocks with oval-top gland as in Fig. 115.

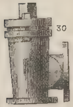


Fig. 114.

Right-angle Oval-top Gland Flange Cock.

1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4 inch.

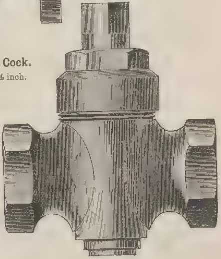


Fig. 115.

Cap-top Cock,

Female Ends.

$\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3 inch.

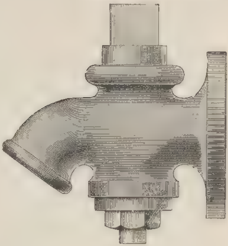


Fig. 116

Flange Blow-off Cock,

Made with either Plain Plug, or Oval Pack Gland.

½, ¾, 1, 1¼, 1½, 2, 2½, 3, 3½, 4 inch.

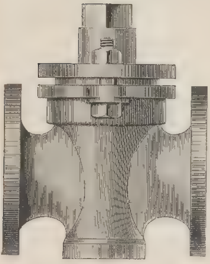


Fig. 117.

Packed Gland Flange Steam Cock.

1, 1¼, 1½, 2, 2½, 3, 3½, 4 inch.

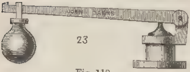


Fig. 118.

Cast-iron Safety Valve.
2, 2½, 3, 4 inch.

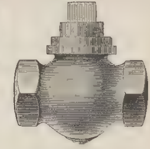


Fig. 119.

Straight Check Valve.
⅜, ½, ¾, 1, 1¼, 1½, 2, 2½, 3 inch.

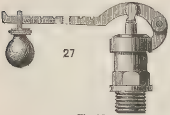


Fig. 120.

Screwed Gun-metal Safety Valve.
½, ¾, 1, 1¼, 1½, 2, 2½ inch.

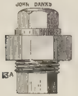


Fig. 121.

Hydraulic Union.
⅜, ½, ¾, 1, 1¼, 1½, 2, 2½, 3 inch.

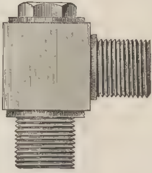


Fig. 122.

Right-angle Check Valve,
Screwed or Flanged.
½, ¾, 1, 1¼, 1½, 2, 2½, 3 inch.

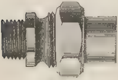


Fig. 123.

Steam Union,
Male and Female.
¼, ⅜, ½, ¾, 1, 1¼, 1½, 2, 2½, 3 inch.

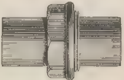


Fig. 124.

Light Brass Union.

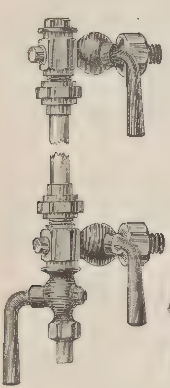


Fig. 125.

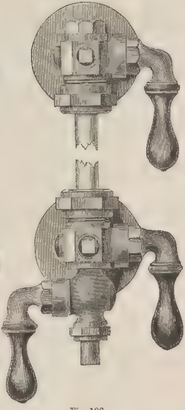


Fig. 126.

Ordinary
Boiler Gauge Cocks,

With Brass Handles.

$\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1 inch.

Strong Asbestos Packed
Gland Boiler Gauge Cocks,

With Flange.

$\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ inch.

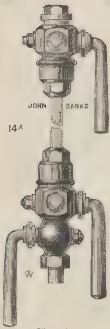


Fig. 127.

Packed Gland Boiler Gauge Cocks

(Screwed).

$\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1 inch.

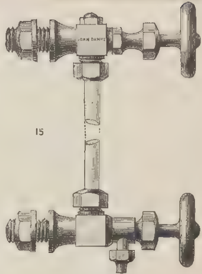


Fig. 128.

Bailey's Patent Gauge Cocks,

Scavenger Pattern.

$\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1 inch.

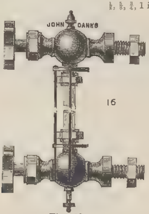


Fig. 129.

Cheap Yankee Pattern Gauge Cocks.

$\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ inch.

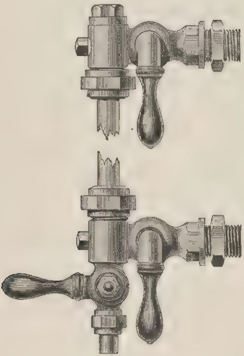


Fig. 130.

Ordinary Boiler Gauge Cock,

With Ebony Handles.

$\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1 inch.

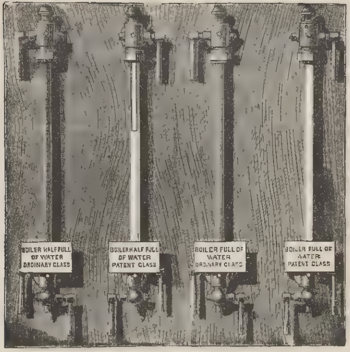


Fig. 131.

Patent Gauge Glasses.

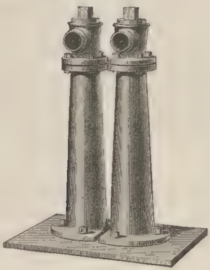
The above drawing almost speaks for itself. The Patent Gauge Glasses, of which we keep a very large stock, are positively the safest and best, and will repay the use of them in ease of mind for the little extra outlay. All sizes in stock.

Single

Air Blast Cock,

For Forge.

Fig. 132.



Double

Air Blast Cock,

For Forge.

Fig 133

ENGINEERS' & PLUMBERS' TOOLS.

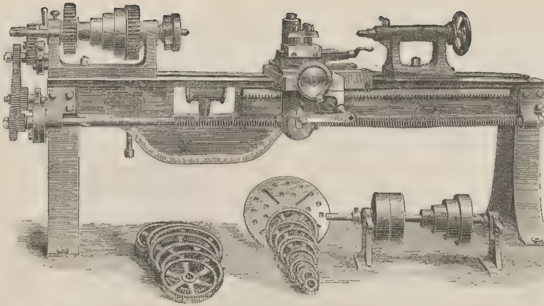


Fig. 134. **8-in. Centre Screw-cutting Lathe,**

With 8 ft. gap bed and powerful double-geared fast headstock, with steel spindle and conical or parallel bearings as preferred, and hard gun metal bushes; the carriage has quick hand traverse by rack and pinion, hand surfacing motion, slide rest to swivel round for conical turning, indexed to set to any angle, and back following stay. The guide screw is accurately cut, and is fitted with double clam nuts and full set of change wheels, and a reversing motion for cutting right or left hand screws; overhead driving apparatus, face plate and catch plate, screw-keys, etc.

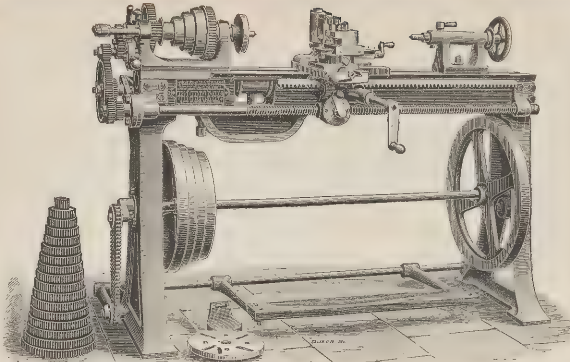


Fig. 135.

Screw-cutting Foot Lathes.

These Lathes are fitted with double-geared headstocks, with conical or parallel bearings as required and steel spindle, quick return of carriage by rack and pinion, with slide rest arranged to surface or turn conical, and indexed to set to any angle, accurately cut guide screw, fitted with double clam nuts of bell metal, adjustable back stay. Tool board at back of the bed, face plate, driving plate, treadle with antifriction motion and heavy balanced fly-wheel and cone. Screw-keys, centres, etc.

6-in. Stroke Improved Shaping Machine,

With variable stroke up to 7in., driven by cone, wheel, and pinion. The head traverses along the bed 1ft. 10in., and has self-acting surfacing cut with variable feed. The ram is indexed and fitted with slides for down cutting and angles. The Table has planed T slots on the top and side, and is adjustable horizontally on the bed, and vertically by screw, with bevel wheels and handle in front.

The machine is also fitted with self acting circular motion for external curves, complete top motion, parallel vice, and screw-keys.

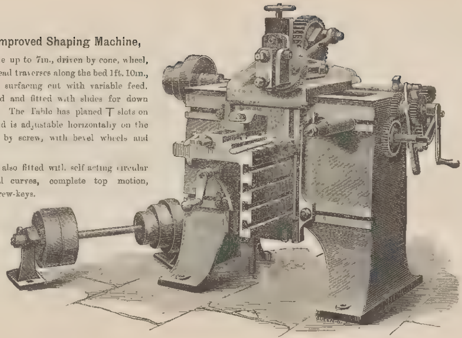


Fig. 136.

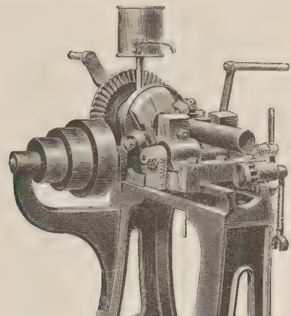


Fig. 137.

Improved Screwing Machine,

Fitted on Stand.

For Gas Tubes, Hand, or Steam Power.

Will screw from ¼ to 2 inch.

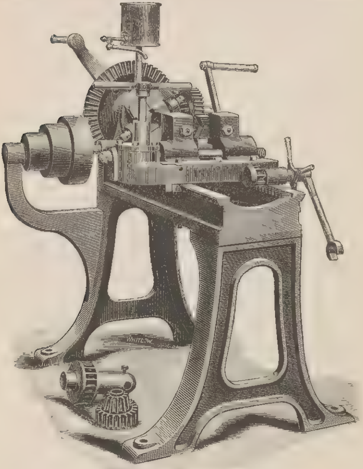


Fig. 138.

Bolt and Nut Screwing Machine,

On Stand.

With 9 Pairs Adjustable Dies and Taps. To screw from ¼ to 1 inch.

For Hand and Steam Power.

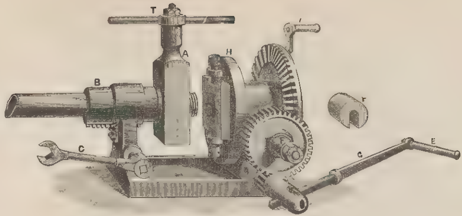


Fig. 139.

Screwing Machine.

For Gas Tubes, with Solid Dies.

No. 4 to screw $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 inch Tubes.
No. 5 ,, $\frac{1}{2}$, $\frac{3}{4}$, 1 inch Tubes.
No. 6 ,, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch Tubes.
No. 7 ,, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch Tubes.

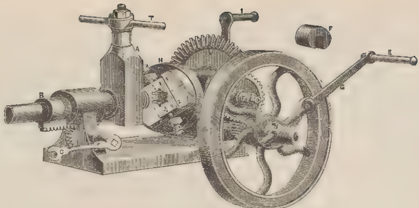


Fig. 140.

Improved Screwing Machines.

For Gas and Steam Tubes.

A Full Thread is attained at One Screwing. These Machines are fitted with Adjustable Dies

No. 1	Screwing	Machine for	½, ¾, 1 inch, with Dies.
No. 1A	,,	,,	¼, ⅜, ½, ¾, 1 inch, with Dies.
No. 2	,,	,,	1, 1¼, 1½, 2 inch, with Dies.
No. 2B	,,	,,	¼, ⅜, ½, ¾, 1, 1¼, 1½, 2 inch, with Dies.

Nos. 2 and 2B, if fitted with 20-inch Fly-wheel, weight 80 lbs. as shown, extra.

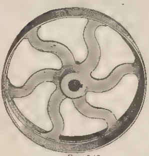


Fig. 141.

Plain Cast-iron Turned Pulleys

Bored, Turned, and Finished.

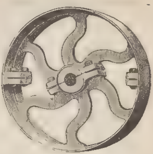


Fig. 142.

Split Cast-iron Pulleys,

All Sizes Made.

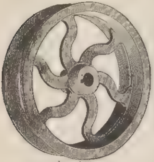


Fig. 143.

Shrouded Cast-iron Pulleys,

Bored, Turned, and Finished.
All Sizes Made.

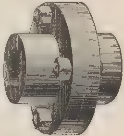


Fig. 144.

Flanged Couplings,

Bored, Faced, Keywayed, Drilled for Bolts and Turned; Bolts and Nuts.
All Sizes Made.

Fig. 145.

Loose Collars,

Bored, Turned, and Fitted with Steel Set Screws.
All Sizes Made.

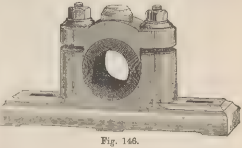


Fig. 146.

Plummer Blocks,

Fitted with Bored and Faced Gun-metal Bearings and Bolts and Nuts. All Sizes Made.

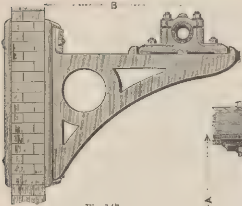


Fig. 147.

Wall Bracket,

With Plummer Block, fixed on with Bolts.

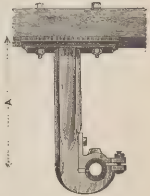
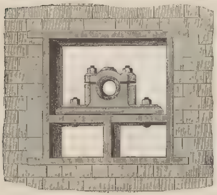


Fig. 148.

Hanging Bracket,

Fitted with Gun-metal Bearings.



No. 149.

Wall Box,

With Plummer Block, fixed on with Bolts.

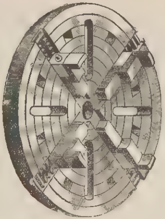


Fig. 150.

Independent Chuck.

Sizes 6, 7, 8, 9, 10, 12, 14, 16, 18, 20, 22, 24, 30 inch.

Self-Centering Chucks,

A LARGE STOCK OF THE DIFFERENT STYLES ALWAYS ON HAND.

Drilling Machines,

Punching and Shearing Machines,

And every description of Tinsmiths' Tools always on hand.

Fig. 151.

Solid Die Stock.

Made to screw up to 3 inch at once going over.

No. 1—$\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$ inch, with or without Taps.
No. 2 $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 inch " "
No. 3—1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch .
No. 4 $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.

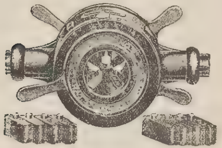


Fig. 152.

Duplex Adjustable Stocks and Dies.

No. 1—$\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$ inch.
No. 2—$\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$ inch.
No. 3—1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.
No. $3\frac{1}{2}$—$\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.
No. 4—$1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3 inch.
No. 5—$2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4 inch.

Fig. 153.

Patent Double-action Ratchet Gas Stock.

A most useful tool for screwing pipe in the ground, only a small hole being required to work in.

No. 1—$\frac{1}{2}$, $\frac{3}{4}$, 1 inch.
No. 2—$1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.

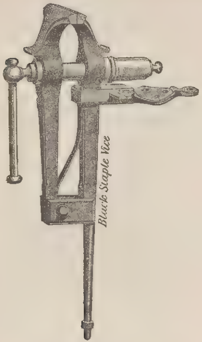


Fig. 154.

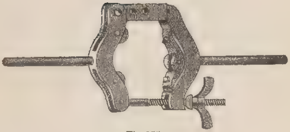


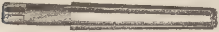
Fig. 155.

Tube Cutter,

For Cutting Cast-iron Main Pipes.
To cut $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4, 5, and 6 inch Pipes.
This is a most useful Tool for Gas and Water-pipe Layers.

ENGINEER'S MASTER TAPS.

ENGINEER'S FIVE FLUTED RIMERS.



MACHINE TAPS, TAPER OR MASTER.

BEST HANDWORKING TAPS

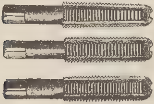


Fig. 156.

Taps and Rimers,

For Whitworth Brass and Gas Threads. All sizes always on hand.

Special Taps and Rimers made to order.

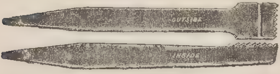


Fig. 157.

Best Engineers' Screw Tools.

All sizes on hand. We make Screw Tools a Speciality.

Fig. 158.

Taper Shank Twist Drills.

All sizes on hand.

Straight Fluted Drills.

All sizes on hand.

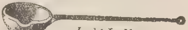
Soldering & Bossing Irons

Fig. 159.

Metal Pot.

Fig. 160.

Fig. 161. *Rasp*



Light Ladle

Fig. 162.

Shave Hooks

Fig. 163.

Pipe Tongs

Fig. 164.

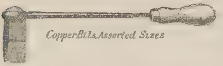
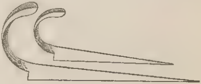


Fig. 165.

Turn Pin.
Fig. 166.

Compo Hooks.
Fig. 167.



Pipe Hooks, in sizes, ½ inch to 6 inch.
Fig. 168.

Chase Wedge.
Fig. 169.

Chipping Knife
Fig. 170.

Round Boxwood Mallet.
Fig. 171.

Bossing Mallet
Fig. 172.

Dresser Hornbeam.
Fig. 173.

We have made special arrangements direct with the different mines, and are able to supply Pig Lead, Ingot Tin, and Ingot Copper at the lowest prices. Our arrangements also enable us to supply mixed metals, such as Ingot Brass, Gun Metal, Phosphor Bronze and Phosphor Tin, at the lowest possible rates, and in many cases customers will find it to their advantage to deal with us in these lines.

Phosphor Tin,

To Mix with other Metals for Bearings, Valves, Locomotive Slides, Plungers, Steam Fittings, Gas Fittings, Bells, Wheels, Water Taps, and other purposes now requiring Gun Metal, Brass, etc.

Phosphorus has been used as an alloy in producing a durable metal for the above requirements, but the cost and difficulties of thus producing good, sound castings have prevented its more general adoption. The convenience of having alloy *ready for mixing with the copper, etc*, is so palpable, as to require little comment, *especially as the prices of Phosphor-tin are such that consumers are placed in a position to make the necessary grades of*

Phosphor Bronze.

THE MANUFACTURE OF PHOSPHOR BRONZE WITH PHOSPHOR-TIN is exceedingly simple. The copper is melted in a plumbago crucible, and when in a fluid state the Phosphor-tin is added. The mixture is then stirred with a wooden rod, covered with a coating of black lead, and then poured out in as large a stream as possible. As the Phosphor-alloys are exceedingly thin when melted, the moulds should be as dry as possible. The fluid metal is not covered with an oxydized skin, but its surface is bright and mirrorlike, showing the distinctive difference between this and common bronze. The casting when finished is exceedingly dense, and if made with ordinary skill, is always free from faults and air holes.

Its relative and absolute density are materially increased thus:—

	TOUGHNESS PER □-CTMETER.	EXTENDS UNTIL BREAKING.
Common Bronze		
88 Copper, 12 Tin	abt 4,700 lb.	2·66 %
Phosphor Bronze		
88 Copper, 6 Tin, 6 Phosphor-tin ,,	6,000 lb.	4·00 %

The Bronze produced with Phosphor-tin can be made in different degrees of toughness and hardness as may be required.

PROPORTIONS FOR MIXING.

	Copper.	Phosphor-tin.	Bancatin.
1. Bells and all parts of Engines with sliding surfaces	80	20	
2. Heavy bearings on steel axles, as Locomotives ...	85	15	
3. Pump Cylinders, Excentrics, heavy bearings for soft shafts	90	10	
4. Grease-cocks, Valves, etc.	90	5	5
5. Common bearings for Waggons	90	5	5
6. Couplings, toothed Wheels, Bolts, Wire	95	5	

Where grounds for economy prevail, and preclude the use of better material, common bronze is most materially improved by substituting for 1-10th part of Tin originally intended for the composition, our Phosphor-tin. In this manner just sufficient Phosphorus is introduced into the mass to get rid of the excess of oxygen, which is the main cause of bubbles.

We make Phosphor Bronze in any of the above proportions.

USEFUL MEMORANDA FOR ENGINEERS.

VARIOUS METALS.—THE WEIGHT OF A SUPERFICIAL FOOT.

Thickness in inches	Wrought Iron.	Cast Iron.	Steel.	Copper	Brass.	Lead	Zinc.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
$\frac{1}{16}$	2·526	2·344	2·552	2·891	2·734	3·708	2·344
$\frac{1}{8}$	5·052	4·687	5·104	5·781	5·469	7·417	4·687
$\frac{3}{16}$	7·578	7·031	7·656	8·672	8·303	11·125	7·031
$\frac{1}{4}$	10·104	9·375	10·208	11·563	10·938	14·833	9 375
$\frac{5}{16}$	12·630	11·719	12·760	14·453	13·672	18·542	11·719
$\frac{3}{8}$	15·156	14·062	15·312	17·344	16·406	22·250	14·062
$\frac{7}{16}$	17·682	16·406	17·865	20·234	19·141	25·958	16 406
$\frac{1}{2}$	20 208	18·750	20·417	23·125	21·875	29·667	18·750
$\frac{9}{16}$	22·734	21·094	22·969	26·016	24 609	33·375	21·094
$\frac{5}{8}$	25·260	23·437	25·521	28·906	27·344	37·083	23·437
$\frac{11}{16}$	27·786	25·781	28·073	31 797	30·078	40·792	25·781
$\frac{3}{4}$	30·312	28·125	30·625	34·688	32·813	44·500	28·125
$\frac{13}{16}$	32·839	30·469	33·177	37·578	35·547	48·208	30·469
$\frac{7}{8}$	35 635	32·812	35·729	40·469	38·281	51·917	32 812
$\frac{15}{16}$	37·891	35·156	38·281	43·359	41 016	55·625	35·156
1	40·417	37·500	40·833	46·250	43·750	59·333	37·500

Add for each side in GALVANIZED IRON ·096 lbs. per ft. sup.

WEIGHT OF A LINEAL FOOT OF ROUND AND SQUARE BAR IRON IN LBS.

Diameter or side	Square Bars.	Round Bars.	Breadth or Diam. in inches.	Square Bars.	Round Bars.	Breadth or Diam. in inches.	Square Bars.	Round Bars.
$\frac{1}{4}$	·209	·164	$1\frac{1}{4}$	5·25	4·09	3	30·07	23·60
$\frac{5}{16}$	·326	·256	$1\frac{3}{8}$	6·35	4·96	$3\frac{1}{4}$	35·28	27·70
$\frac{3}{8}$	·470	·369	$1\frac{1}{2}$	7·51	5 90	$3\frac{1}{2}$	40·91	32·13
$\frac{7}{16}$	·640	·502	$1\frac{5}{8}$	8·82	6·92	$3\frac{3}{4}$	46·97	36·89
$\frac{1}{2}$	·835	·656	$1\frac{3}{4}$	10·29	8·03	4	53·44	41·97
$\frac{9}{16}$	1 057	·831	$1\frac{7}{8}$	11·74	9·22	$4\frac{1}{4}$	60·32	47·38
$\frac{5}{8}$	1·305	1·025	2	13·36	10 49	$4\frac{1}{2}$	67·63	53·12
$\frac{11}{16}$	1·579	1·241	$2\frac{1}{8}$	15·08	11·84	$4\frac{3}{4}$	75·35	59·18
$\frac{3}{4}$	1·879	1·476	$2\frac{1}{4}$	16·91	13·27	5	83·51	65·58
$\frac{13}{16}$	2·205	1·732	$2\frac{3}{8}$	18·84	14·79	$5\frac{1}{4}$	92·46	72·30
$\frac{7}{8}$	2·556	2·011	$2\frac{1}{2}$	20·87	16·39	$5\frac{1}{2}$	101·03	79·35
$\frac{15}{16}$	2·936	2·306	$2\frac{5}{8}$	23·11	18·07	$5\frac{3}{4}$	110·43	86·73
1	3·34	2·62	$2\frac{3}{4}$	25·26	19·84	6	120·24	94·43
$1\frac{1}{8}$	4·22	3·32	$2\frac{7}{8}$	27·61	21·68	—	—	—

To convert into weight of other metals, multiply tabular No. for cast iron by ·93, for steel × 1·02, for copper × 1·15, for brass × 1·09, for lead × 1·47, for zinc × ·92.

WEIGHT OF A LINEAL FOOT OF FLAT BAR IRON IN LBS.

Breadth in inches.	Thickness in Fractions of inches.								
	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1
1	·83	1·04	1·25	1·46	1·67	2·08	2·50	2·92	3·34
$1\frac{1}{8}$	·93	1·17	1·40	1·64	1·87	2·34	2·81	3·28	3·75
$1\frac{1}{4}$	1·04	1·30	1·56	1·82	2·08	2·60	3·13	3·65	4·17
$1\frac{3}{8}$	1·14	1·43	1·72	2·00	2·29	2·87	3·44	4·01	4·59
$1\frac{1}{2}$	1·25	1·56	1·87	2·19	2·50	3·13	3·75	4·38	5·00
$1\frac{5}{8}$	1·35	1·69	2·03	2·37	2·71	3·39	4·07	4·70	5·43
$1\frac{3}{4}$	1·46	1·82	2·19	2·55	2·92	3·65	4·38	5·11	5·84
$1\frac{7}{8}$	1·56	1·95	2·34	2·74	3·13	3·91	4·69	5·47	6·26
2	1·67	2·08	2·50	2·92	3·34	4·17	5·01	5·86	6·68
$2\frac{1}{8}$	1·77	2·21	2·66	3·10	3·55	4·43	5·32	6·21	7·10
$2\frac{1}{4}$	1·87	2·34	2·81	3·28	3·76	4·69	5·63	6·57	7·52
$2\frac{3}{8}$	1·98	2·47	2·97	3·47	3·96	4·95	5·95	6·94	7·93
$2\frac{1}{2}$	2·08	2·60	3·13	3·65	4·17	5·21	6·26	7·30	8·35
$2\frac{5}{8}$	2·19	2·74	3·28	3·83	4·38	5·47	6·57	7·67	8·77
$2\frac{3}{4}$	2·29	2·87	3·44	4·01	4·59	5·74	6·88	8·03	9·18
$2\frac{7}{8}$	2·40	3·00	3·60	4·20	4·80	6·00	7·20	8·40	9·60
3	2·50	3·13	3·75	4·38	5·01	6·26	7·51	8·76	10·02
$3\frac{1}{4}$	2·71	3·39	4·07	4·74	5·43	6·78	8·14	9·49	10·86
$3\frac{1}{2}$	2·92	3·65	4·38	5·11	5·84	7·30	8·76	10·23	11·69
$3\frac{3}{4}$	3·13	3·91	4·68	5·47	6·26	7·82	9·39	10·95	12·52
4	3·34	4·17	5·00	5·84	6·68	8·35	10·02	11·69	13·36
$4\frac{1}{4}$	3·54	4·43	5·32	6·21	7·09	8·87	10·64	12·42	14·19
$4\frac{1}{2}$	3·75	4·69	5·63	6·57	7·51	9·39	11·27	13·15	15·03
$4\frac{3}{4}$	3·96	4·95	5·94	6·94	7·93	9·91	11·89	13·88	15·86
5	4·17	5·21	6·26	7·30	8·35	10·44	12·52	14·61	16·70
$5\frac{1}{4}$	4·38	5·47	6·57	7·67	8·76	10·96	13·14	15·34	17·53
$5\frac{1}{2}$	4·59	5·73	6·88	8·03	9·18	11·48	13·77	16·07	18·37
$5\frac{3}{4}$	4·80	6·00	7·20	8·40	9·60	12·00	14·40	16·80	19·20
6	5·01	6·25	7·51	8·76	10·02	12·53	15·03	17·53	20·05

WEIGHT OF ROUND AND SQUARE COPPER RODS IN LBS. PER LINEAL FOOT.

Size of Rod.	Weight per Lineal Foot.		Size of Rod.	Weight per Lineal Foot.		Size of Rod.	Weight per Lineal Foot.	
	Round.	Square.		Round.	Square.		Round.	Square.
$\frac{1}{4}$	0·19	0·24	$1\frac{1}{8}$	3·86	4·91	2	12·20	15·53
$\frac{5}{16}$	0·30	0·38	$1\frac{3}{16}$	4·30	5·47	$2\frac{1}{16}$	12·97	16·51
$\frac{3}{8}$	0·43	0·55	$1\frac{1}{4}$	4·77	6·06	$2\frac{1}{8}$	13·77	17·53
$\frac{7}{16}$	0·58	0·74	$1\frac{5}{16}$	5·25	6·68	$2\frac{3}{16}$	14·60	18·58
$\frac{1}{2}$	0·76	0·97	$1\frac{3}{8}$	5·77	7·34	$2\frac{1}{4}$	15·44	19·65
$\frac{9}{16}$	0·96	1·23	$1\frac{7}{16}$	6·30	8·02	$2\frac{5}{16}$	16·31	20·76
$\frac{5}{8}$	1·19	1·52	$1\frac{1}{2}$	6·86	8·73	$2\frac{3}{8}$	17·20	21·90
$\frac{11}{16}$	1·44	1·83	$1\frac{9}{16}$	7·45	9·48	$2\frac{7}{16}$	18·12	23·06
$\frac{3}{4}$	1·72	2·18	$1\frac{5}{8}$	8·05	10·25	$2\frac{1}{2}$	19·06	24·26
$\frac{13}{16}$	2·01	2·56	$1\frac{11}{16}$	8·69	11·05	$2\frac{5}{8}$	21·02	26·75
$\frac{7}{8}$	2·33	2·97	$1\frac{3}{4}$	9·34	11·89	$2\frac{3}{4}$	23·07	29·36
$\frac{15}{16}$	2·68	3·41	$1\frac{13}{16}$	10·02	12·75	$2\frac{7}{8}$	25·21	32·09
1	3·05	3·88	$1\frac{7}{8}$	10·72	13·65	3	27·45	34·94
$1\frac{1}{16}$	3·44	4·38	$1\frac{15}{16}$	11·45	14·57			

Comparative Weights of Different Metals, etc.

Cast Iron=1.		Gun Metal=1.	
Wrought Iron	=1·049	Cast Iron	= ·829
Steel	=1·080	Wrought Iron	= ·879
Brass	=1·160	Steel	= ·898
Copper	=1·210	Brass	= ·958
Gun Metal	=1·209	Copper	=1·001
Lead	=1·560	Lead	=1·296

Wrought Iron=1.		Copper=1.	
Cast Iron	= ·95	Cast Iron	·831
Steel	=1·026	Wrought Iron	·868
Brass	=1·097	Steel	= ·888
Gun Metal	=1·150	Brass	= ·949
Copper	=1·152	Gun Metal	= 998
Lead	=1·500	Lead	=1·298

Steel=1.		White Metal=1.	
Cast Iron	= ·929	Cast Iron	= ·793
Wrought Iron	= ·974	Wrought Iron	= ·814
Brass	=1·071	Steel	= ·846
Gun Metal	=1·121	Gun Metal	= ·912
Copper	=1·124	Copper	= ·954
Lead	=1·454	Lead	1·201

Brass=1.		Lead=1.	
Cast Iron	= ·865	Cast Iron	.641
Wrought Iron	= ·915	Wrought Iron	670
Steel	= ·934	Steel	·689
Gun Metal	=1·045	Brass	= ·739
Copper	=1·051	Gun Metal	·771
Lead	=1·355	Copper	= 778

Yellow Pine=1.

Cast Iron	=16·00	Brass	=18·80	Copper	=19·30
Steel	=17·00	Gun Metal	=19·00	Lead	24·00

Example of the use of this Table.—A Wrought Iron plate weighs 700lbs., required the weight of a similar plate of Gun Metal; then 700×1·15=805 lbs.

Various Metals.

Multipliers to convert the weights as found above into the weights of other metals.

Weight of wrought iron	× ·92	= weight of	zinc.
,, ,,	× ·93	,,	cast iron.
,, ,,	× ·94 =	,,	tin.
,, ,,	× 1·04 =	,,	steel.
,, ,,	× 1·09	,,	brass.
,, ,,	× 1·15	,,	copper.
,, ,,	× 1·47	,,	lead.
Cube inches ,,	× ·252	lbs. of	zinc.
,, ,,	× ·26 =	,,	cast iron.
,, ,,	× ·262	,,	tin.
,, ,,	× 288 =	,,	steel.
,, ,,	× ·3	,,	brass.
,, ,,	× ·32 =	,,	copper.
,, ,,	× ·41 =	,,	lead.

A bar of wrought iron 1 × 1 and 1 yard long weighs 10 lbs.

THE WEIGHTS OF VARIOUS METALS (per cubic foot).

	lbs.		lbs.
Aluminium	162	Lead, cast	710
Antimony, cast	419	Mercury, fluid	848
Bismuth, cast	614	,, solid	977
Brass, cast	525	Nickel, cast	788
,, wire	534	Platinum, pure	1,220
Bronze	513	,, wire drawn	1,300
Copper, cast	550	,, hammered	1,280
,, sheet and wire	555	Pewter	453
Gold, pure	1,210	Silver, pure	655
,, standard	1,108	,, standard	658
Gun metal	549	Steel	490
Iron, wrought	485	Tin, cast	456
,, cast	450	Type-metal	653
Lead, milled	712	Zinc	450

WEIGHT OF A SQUARE FOOT OF SHEET METALS IN LBS.
Thickness Birmingham Wire Gauge.

Thickness B.W.G.	Iron.	Copper.	Brass.	Thickness B.W.G.	Iron.	Copper.	Brass.
30	·48	·550	·527	15	2·88	3·298	3·161
29	·52	·595	·579	14	3·32	3·801	3·644
28	·56	·641	·615	13	3·80	4·351	4·170
27	·64	·733	·702	12	4·36	4·992	4·785
26	·72	·824	·790	11	4·80	5·496	5·268
25	·80	·916	·878	10	5·36	6·137	5·883
24	·88	1·008	·966	9	5·92	6·778	6·497
23	1·00	1·145	1·097	8	6·60	7·557	7·243
22	1·12	1·282	1·229	7	7·20	8·244	7·902
21	1·28	1·466	1·405	6	8·12	9·297	8·912
20	1·40	1·603	1·536	5	8·80	10·076	9·658
19	1·68	1·924	1·844	4	9·52	10·900	10·448
18	1·96	2·244	2·151	3	10·36	11·862	11·370
17	2·32	2·656	2·546	2	11·36	13·007	12·468
16	2·60	2·977	2·853	1	12·00	13·740	13·170

TABLE OF PRESSURE OF WATER, LBS. PER SQUARE INCH.

Head Feet	0	1	2	3	4	5	6	7	8	9
0	—	·4335	·8670	1·3005	1·7340	2·1675	2·6010	3·0345	3·4681	3·9016
10	4·3351	4·7686	5·2021	5·6356	6·0691	6·5026	6·9361	7·3696	7·8031	8·2366
20	8·6701	9·1036	9·5372	9·9707	10·4042	10·8377	11·2712	11·7047	12·1382	12·5717
30	13·0052	13·4387	13·8722	14·3057	14·7392	15·1727	15·6063	16·0398	16·4733	16·9068
40	17·3403	17·7738	18·2073	18·6408	19·0743	19·5078	19·9413	20·3748	20·8083	21·2418
50	21·6754	22·1089	22·5424	22·9759	23·4094	23·8429	24·2764	24·7099	25·1434	25·5769
60	26·0104	26·4439	26·8774	27·3109	27·7444	28·1780	28·6114	29·0450	29·478	29·9120
70	30·3455	30·7790	31·2125	31·6460	32·0795	32·5130	32·9465	33·3800	33·8135	34·2471
80	34·6806	35·1141	35·5476	35·9811	36·4146	36·8481	37·2816	37·7151	38·1486	38·5821
90	39·0156	39·4491	39·8826	40·3162	40·7497	41·1832	41·6167	42·0502	42·4837	42·9172

For other heads than those given, alter the decimal point as necessary; for example, pressure per square inch due to 77 feet = 33·38 lbs. per square inch, for 7·7 = 3·338 lbs., for 770 = 333·8.

WEIGHT OF COPPER PIPES IN LBS. PER FOOT LINEAL.

Bore Inch.	Thickness in Parts of Inch. $\frac{1}{16}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	Bore Inch.	Thickness in Parts of Inch. $\frac{1}{16}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$
½	·42	·94	1·60	2·27	2	1·55	3·21	5·00	6·80
¾	·62	1·33	2·17	3·02	2½	1·94	3·97	6·13	8·31
1	·79	1·69	2·66	3·77	3	2·3	4·73	7·24	9·84
1½	1·15	2·44	3·85	5·30					

WEIGHT OF SEAMLESS BRASS TUBES.

Thickness of Brass.

Wire Gauge.		7	8	9	10	11	12	13	14	15	16	17	18	19	20
Inches -	-	·180	·165	·148	·134	·120	·109	·095	·083	·072	·065	·058	·049	·042	·035
Millimetres -	-	4·57	4·19	3·76	3·40	3·05	2·77	2·41	2·11	1·83	1·65	1·47	1·24	1·07	·89
Ext. Dia.		Weight of a Lineal Foot in Lbs.													
Ins.	Mm														
½	12·7	—	—	—	—	—	—	—	—	—	·32	·29	·26	·22	·
⅝	15·9	—	—	—	—	—	—	—	—	·46	·42	·38	·32	·27	·
¾	19·0		—	—	—	—	—	·72	·64	·56	·51	·46	·40	·34	·
⅞	22·2	—	—	—	—	—	·97	·85	·76	·66	·61	·55	·46	·40	·
1	25·4	—	—	—	—	1·22	1·12	1·00	·88	·77	·69	·64	·54	·46	·
1⅛	28·6			—	1·55	1·40	1·28	1·13	1·00	·87	·79	·72	·61	·52	—
1¼	31·7	—		—	1·74	1·57	1·44	1·27	1·12	·98	·88	·80	·67	·58	—
1⅜	34·9		—	2·11	1·93	1·75	1·60	1·41	1·24	1·08	·98	·88	·75	—	—
1½	38·1	—	—	2·32	2·13	1·92	1·76	1·55	1·36	1·19	1·07	·97	·82		—
1⅝	41·3		2·78	2·54	2·32	2·09	1·92	1·68	1·48	1·29	1·17	1·05	—	—	—
1¾	44·4	—	3·02	2·74	2·52	2·27	2·07	1·82	1·60	1·40	1·26	1·14	—	—	—
1⅞	47·6	3·54	3·27	2·96	2·71	2·44	2·23	1·96	1·72	1·50	1·36	1·22	—	—	—
2	50·8	3·80	3·50	3·17	2·91	2·61	2·38	2·10	1·84	1·60	1·45	1·30		—	—
2⅛	54·0	4·07	3·74	3·39	3·10	2·78	2·55	2·23	1·97	1·71	1·55	1·39	—		
2¼	57·1	4·32	3·98	3·61	3·29	2·96	2·71	2·37	2·08	1·81	1·64	1·48	—	—	—
x		·74	·64	·50	·41	·33	·27	·21	·16	·12	·10	·08	·06	·05	·03

WEIGHT OF BRASS TUBES—*continued.*

B.W.G.		5	6	7	8	9	10	11	12	13	14	15	16
Ins.	Mm.	Weight of a Lineal Foot in Lbs.											
2⅜	60·3	5·49	5·10	4·58	4·22	3·82	3·49	3·13	2·86	2·51	2·20	1·92	1·73
2½	63·5	5·81	5·40	4·84	4·45	4·04	3·68	3·31	3·02	2·65	2·33	2·02	1·82
2⅝	66·7	6·13	5·69	5·10	4·70	4·25	3·88	3·49	3·18	2·78	2·44	2·12	1·92
2¾	69·8	6·45	5·98	5·37	4·94	4·46	4·07	3·66	3·33	2·93	2·56	2·22	2·01
2⅞	73·0	6·76	6·28	5·62	5·18	4·67	4·26	3·83	3·50	3·06	2·69	2·33	2·11
3	76·2	7·09	6·57	5·89	5·41	4·89	4·45	4·01	3·65	3·20	2·80	2·43	2·20
3⅛	79·3	7·40	6·87	6·15	5·65	5·11	4·65	4·18	3·80	3·34	2·93	2·54	2·30
3¼	82·5	7·72	7·16	6·40	5·89	5·32	4·84	4·35	3·97	3·48	3·05	2·64	2·39
3⅜	85·7	8·04	7·46	6·66	6·13	5·53	5·04	4·52	4·13	3·62	3·17	2·74	2·49
3½	88·9	8·36	7·75	6·92	6·37	5·75	5·23	4·70	4·28	3·75	3·29	2·85	2·58
3⅝	92·0	8·68	8·05	7·19	6·61	5·96	5·42	4·87	4·44	3·89	3·40	2·95	2·68
3¾	95·2	9·00	8·34	7·45	6·85	6·17	5·61	5·04	4·60	4·03	3·52	3·06	2·77
3⅞	98·4	9·31	8·63	7·71	7·09	6·39	5·80	5·22	4·75	4·16	3·65	3·16	2·86
4	101·6	9·63	8·93	7·97	7·32	6·60	6·00	5·40	4·91	4·30	3·77	3·27	2·95
x		1·12	0·96	0·74	0·64	0·50	0·41	0·33	0·27	0·21	0·16	0·12	0·10

If the internal diameter is given, add x. For example: the weight per lineal foot of a brass tube 2 inches internal diameter 12 W.G. is 2·38 + 0·27 = 2·65 lbs.

To ascertain the weight of a seamless tube of other metal, multiply the weight of a similar brass tube by 1·05 for copper, 0·90 for wrought iron, 0·84 for cast iron, or by 1·34 for lead; *f* full, *b* bare.

APPROXIMATE WEIGHTS OF GAS TUBES AND FITTINGS.

SIZE.	TUBES.							FITTINGS.					
	Weight per 100 feet			Weight per 1,000 feet.				Weight of 10 Elbows		Weight of 10 Tees.		Weight of 10 Crosses.	
	C.	QRS.	LBS.	T.	C.	QRS.	LBS.	LBS.	OZS.	LBS.	OZS.	LBS.	OZS.
⅛	...	1	0	...	2	2	0	1	1	1	0	1	8
¼	...	1	14	...	3	3	0	1	7	1	8	1	14
⅜	...	2	6	...	5	2	4	1	13	2	4	2	3
½	...	3	6	...	8	0	4	2	15	3	0	3	4
¾	1	0	22	...	11	3	24	4	6	5	4	5	11
1	1	3	0	...	17	2	0	6	4	7	10	9	2
1¼	2	1	11	1	3	1	26	10	10	12	15	14	11
1½	2	3	7	1	8	0	14	15	8	16	7	18	10
1¾	3	0	12	1	11	0	8	15	12	20	0	21	4
2	3	3	21	1	19	1	14	22	6	27	0	31	4
2¼	4	0	26	2	2	1	8	30	2	32	8	41	4
2½	5	0	6	2	10	2	4	46	2	50	15	51	4
2¾	5	1	19	2	14	0	22	55	10	68	8	80	10
3	6	0	20	3	1	3	4	73	8	85	5	88	12
3½	7	1	14	3	13	3	0	101	0	121	0	129	0
4	8	2	0	4	5	0	0	126	0	144	0	158	0

REVISED LIST OF WROUGHT-IRON GAS TUBES AND FITTINGS.

	Internal Diameter.		$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	2	$2\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{3}{4}$	3	$3\frac{1}{2}$	4
			s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
TUBES.	Tubes, from 2 to 14ft. long	[illegible]	0 2	0 $2\frac{1}{2}$	0 3	0 $4\frac{1}{4}$	0 6	0 $8\frac{1}{2}$	1 0	1 3	1 6	1 9	2 6	3 [illegible]	4 0	4 6	5 6	7 0
	Long Screws ...	each	0 [illegible]	0 7	0 9	0 11	1 2	1 6	2 0	2 6	3 3	4 0	5 6	[illegible] 0	8 6	10 0	12 6	15 6
	Bends	,,	0 $5\frac{1}{2}$	0 [illegible]	[illegible] 7	0 8	0 11	1 3	1 9	2 3	3 3	4 3	6 6	10 0	12 0	16 0	25 0	32 6
	Springs, not socketed	,,	0 4	0 5	0 6	[illegible] 7	0 9	0 11	1 4	1 8	2 6	3 [illegible]	5 6	7 6	10 0	12 0	19 0	26 0
FITTINGS.	Elbows	,,	0 6	0 $6\frac{1}{2}$	0 7	0 8	0 10	1 [illegible]	1 9	2 8	[illegible]	3 6	5 6	8 6	11 0	14 0	22 0	28 0
	Tees	,,	0 6	0 $6\frac{1}{2}$	0 7	0 9	1 0	1 3	[illegible] 9	2 [illegible]	3 0	3 9	6 0	9 6	12 6	16 6	24 0	30 0
	Crosses	,,	1 2	1 4	1 4	1 11	2 4	3 0	4 [illegible]	[illegible] 8	6 0	7 0	11 0	21 4	28 0	40 0	56 0	66 8
	Plain Sockets ...	,,	0 $1\frac{1}{2}$	0 $1\frac{3}{4}$	0 2	0 3	0 $3\frac{1}{2}$	0 4	[illegible] 6	0 7	[illegible] 9	1 0	1 6	2 6	3 0	3 6	5 0	6 0
	Diminished Sockets	,,		0 3	0 4	0 5	0 6	0 [illegible]	0 9	0 11	1 [illegible]	[illegible] 3	2 0	3 0	4 0	5 0	7 0	9 0
	Flanges	,,	0 8	0 9	0 10	1 0	1 2	[illegible] 4	1 6	1 9	2 0	2 [illegible]	3 9	5 0	6 9	8 6	10 0	11 6
	Caps and Plugs ...	,,	0 2	0 3	0 3	0 4	0 5	0 6	0 8	0 10	1 0	1 3	2 [illegible]	2 6	3 6	4 9	7 0	10 0
	Backnuts and Nipples	,,	0 1	0 2	0 2	0 [illegible]	0 $3\frac{1}{2}$	0 4	0 6	0 8	0 10	1 0	1 9	2 [illegible]	3 0	3 6	4 6	5 6
	Round Elbows ...	,,	0 7	0 7	[illegible]	0 9	1 0	1 4	1 11	2 6	3 4	3 10	6 6	10 0	[illegible] 0	16 0	25 0	32 0
	Iron Main Cocks ...	,,	2 3	2 [illegible]	2 9	3 6	4 6	6 6	8 6	11 0	14 0	18 0	27 0	36 0	41 [illegible]	50 0	75 0	90 0
	Ditto, with Brass Plugs	,,			4 6	5 6	7 6	10 6	15 0	19 6	25 0	32 0	47 0	60 0	90 0	110 0	140 0	190 0
	Round-way Iron Cocks	,,			3 6	4 0	5 6	7 6	10 0	13 0	17 6	22 0	38 0	51 0	62 0	70 0	[illegible] 0	160 0
	Ditto, with Brass Plugs	,,			5 0	6 6	9 0	13 0	19 0	25 0	36 0	42 0	60 0	85 0	105 0	120 0	180 0	280 0

Ferrotype (or Blue) Process

For Copying Tracings of Machinery, Etc.

By this process prints are produced in Prussian blue and white, a print taken direct from an ordinary tracing in Indian ink giving white lines on a blue ground.

SENSITIZING SOLUTION.

A	Citrate of iron and ammonia	100 grains.
	Water	1 ounce.
B	Red prussiate of potash	70 grains.
	Water	1 ounce.

These solutions will keep indefinitely before mixing, but, when mixed, they should be used at once or left in the dark.

PREPARING THE PAPER.

Mix equal quantities of A and B and apply to one side of the paper with a sponge. The sponge should be as full as it will hold of the solution, which should be liberally applied to the paper for about two minutes. Then squeeze out the sponge and wipe off all the solution from the surface of the paper, care being taken to use the sponge *lightly without* abrading the surface. The paper, which is now of a bright yellow colour on the prepared side, should be hung up to dry in the dark.

PRINTING.

The printing is done in every respect in the same manner as for ordinary photographic silver prints, the tracing representing the negative.

Behind the glass of the printing frame lay the tracing, face next the glass, behind the tracing the prepared paper, prepared surface next the tracing. Put out in the sun or diffused daylight until sufficiently printed.

In bright sunlight, from 9 a.m. to noon, the time required will be from eight to ten minutes. In the afternoon a somewhat longer exposure must be given.

FIXING.

The print is fixed by simply washing thoroughly in clean water.

ADDITIONS AND ERASURES.

A white line may be taken out by going over it with a quill pen or brush dipped in the sensitizing solution, exposing to the sun, and washing as before. Additions or corrections in white may be made with a quill pen dipped in a solution of forty grains of carbonate of potash to one ounce of water. After using this solution, the potash must be dried with blotting paper and washed, or the lines will spread and become blurred.

Quick-acting Steam Valve, with Lever.

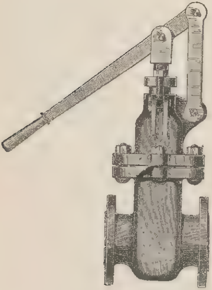


Fig. 173A.

This style of Steam Valve is usually used for steam hammers. We make it either screwed or with flanges as may be desired. This valve should certainly be used in all factories where there is a danger of the employés becoming entangled with the machinery, or of accidents of a like kind. By its use the steam may be immediately cut off from the engine, and the machinery at once stopped.

We have for many years used this class of valve on our steam supply pipe at our factory, and on more than one occasion it has prevented most serious accidents.

PLUMBERS' BRASS WORK AND BATH MOUNTINGS.

WATER COCKS.

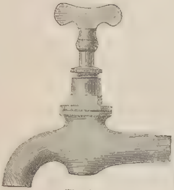


Fig. 174.
High-pressure Bib Cock,
For Lead.
$\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.

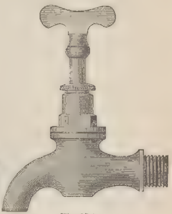


Fig. 175.
High-pressure Bib Cock,
For Iron.
$\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$ x $\frac{5}{8}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.

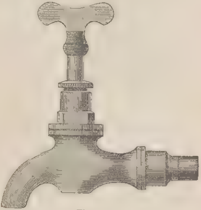


Fig. 176.
High-pressure Bib Cock, with screw boss.
$\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$ x $\frac{3}{4}$, $\frac{3}{4}$, 1 inch.

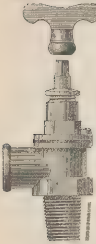


Fig. 177.

Ferrule Stop Cock,

For Iron.

$\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.

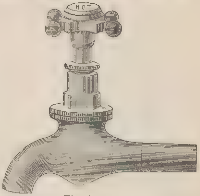


Fig. 178.

High-pressure Bib Cock, for Lead.

Tablet Lettered Hot or Cold.
$\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1 inch.
Polished or Nickel Plated.

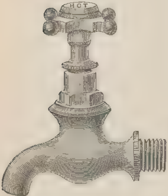


Fig. 179.

High-pressure Bib Cock, for Iron.

Tablet Lettered Hot or Cold.
$\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 inch.
Polished or Nickel Plated.

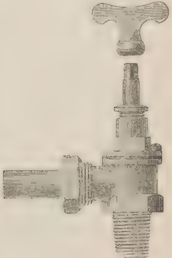


Fig. 180.

Ferrule Stop Cock, for Lead.

$\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.

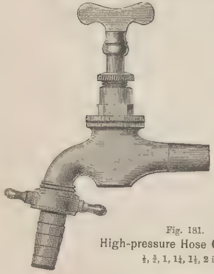


Fig. 181.
High-pressure Hose Cock, for Lead.
$\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.

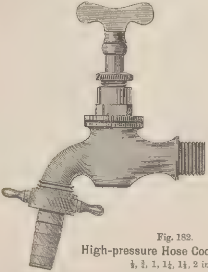


Fig. 182.
High-pressure Hose Cock, for Iron.
$\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.

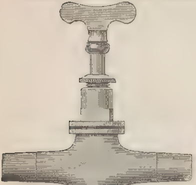


Fig. 183.

High-pressure Stop Cock, for Lead.

$\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.

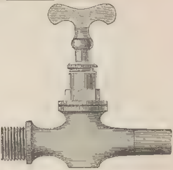


Fig. 184.

High-pressure Stop Cock,

For Lead and Iron.

$\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.

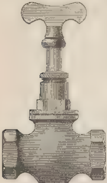


Fig. 185.

High-pressure Stop Cock

For Iron, Female Ends.

$\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3 inch.

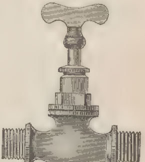


Fig. 186.

High-pressure Stop Cock,

For Iron, Male Ends.

$\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1 inch.

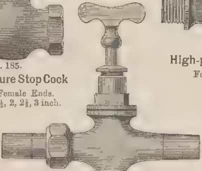


Fig. 187.

High-pressure Stop Cock, for Lead, with Union.

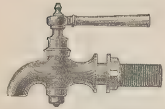


Fig. 188.
Range Cock.
½, ⅝, ¾, ⅞, 1, 1¼, 1½, 2 inch.

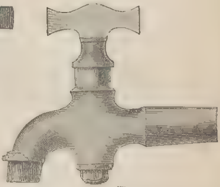


Fig. 190.
Low-pressure Bib Cock,
For Lead Pipe.
½, ⅝, ¾, ⅞, 1, 1¼, 1½, 2 inch.

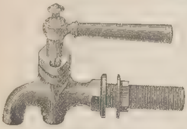


Fig. 189.
Packed Gland Range Cock.
½, ¾, 1, 1¼, 1½, 2 inch.

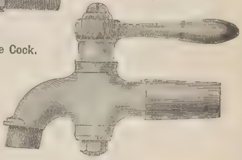


Fig. 191.
Low-pressure Bib Cock, for Lead Pipe, with Lever Handle.
½, ⅝, ¾, ⅞, 1, 1¼, 1½, 2 inch.

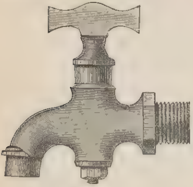


Fig. 192.
Low-pressure Bib Cock,
For Iron.
$\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.

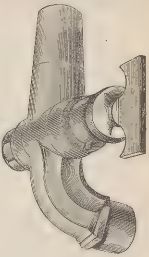


Fig. 193.
Low-pressure Sideway Bib Cock,
For Lead.
$\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1 inch.

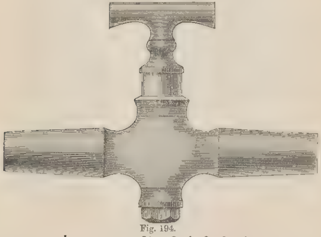


Fig. 194.
Low-pressure Stop Cock, for Lead.
$\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1 inch.

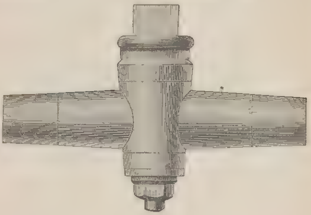


Fig. 195.

Low-pressure Stop Cock,

For Lead Pipe.

$\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.

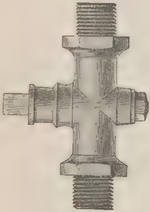


Fig. 196.

Low-pressure Stop Cock,

For Iron Pipe.

$\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.

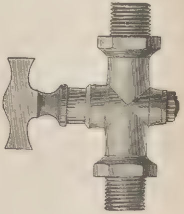


Fig. 197.

Low-pressure Stop Cock,

For Iron Pipe.

$\frac{1}{2}$, $\frac{3}{4}$, 1 inch.

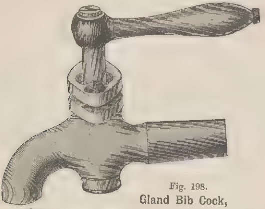


Fig. 198.
Gland Bib Cock,
For Lead Pipe.
$\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1 inch.

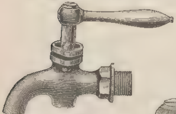


Fig. 199.
Gland Bib Cock,
For Iron Pipe.
$\frac{1}{2}$, $\frac{3}{4}$, 1 inch.

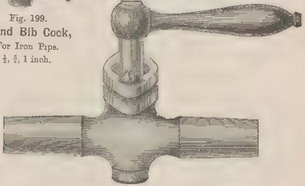


Fig. 200.
Gland Stop Cock,
For Lead Pipe.
$\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1 inch.

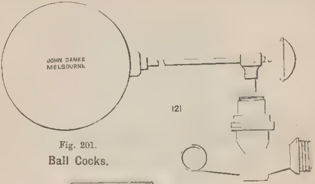


Fig. 201.
Ball Cocks.

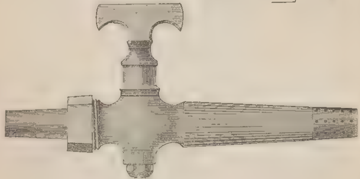


Fig. 202. Straight Tapping Cock, with Union.

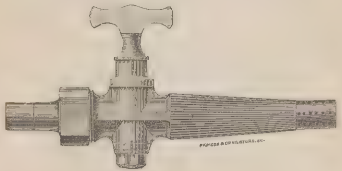


Fig. 203. Straight Tapping Cock, with Union.

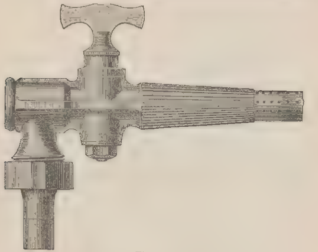


Fig. 204.
Bent Nose Tapping Cock, with Union.

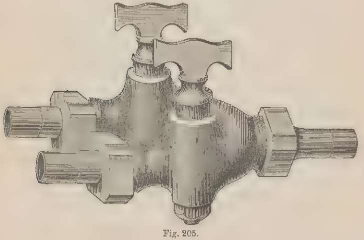


Fig. 205.
Double Action Beer Mixing Cock.

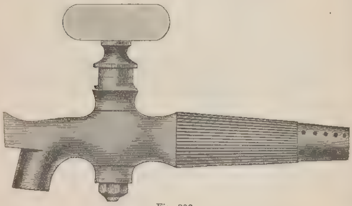


Fig. 206.

Racking Cock, Nighted.

$\frac{3}{8}$, $\frac{7}{16}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1, $1\frac{1}{4}$ inch.

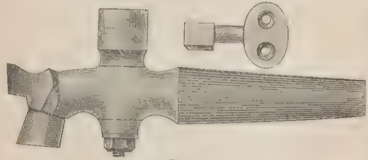


Fig. 207.

Racking Cock, Lock.

$\frac{3}{8}$, $\frac{7}{16}$, $\frac{1}{2}$, $\frac{9}{16}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, 1, $1\frac{1}{4}$ inch.

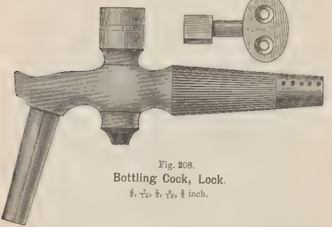


Fig. 208.

Bottling Cock, Lock.

$\frac{3}{8}$, $\frac{7}{16}$, $\frac{1}{2}$, $\frac{9}{16}$, $\frac{5}{8}$ inch.

Fig. 209.

Bottling Cock, Nighted.

$\frac{3}{8}$, $\frac{7}{16}$, $\frac{1}{2}$, $\frac{5}{8}$ inch.

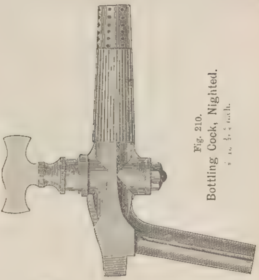


Fig. 210.
Bottling Cock, Nighted.

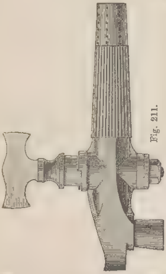


Fig. 211.
Beer Cock, Nighted.

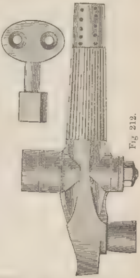


Fig. 212.
Beer Cock, Lock.

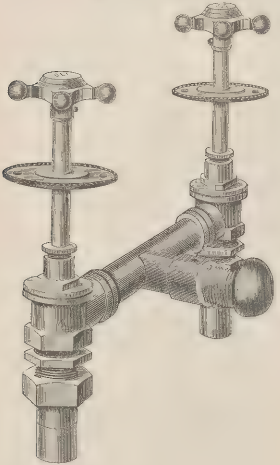


Fig. 213.

Combined High-pressure Screw-down Bath Cock,

Lettered Hot and Cold.

$\frac{3}{4}$, 1 inch.

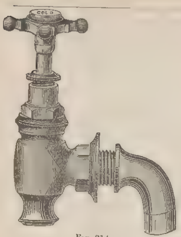


Fig. 214.
High-pressure Gun-metal Bath Cock.
Lettered Hot or Cold. Polished or Nickel Plated.
¾, 1 inch.

Fig. 215.
Loose Key for High-pressure Cocks.
Made to Suit All Sizes.

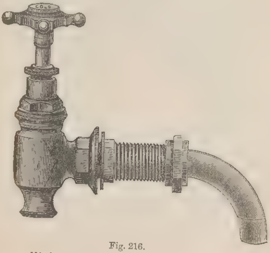


Fig. 216.
High-pressure Gun-metal Bath Cock.
Lettered Hot or Cold. Polished or Nickel Plated.
¾, 1 inch.

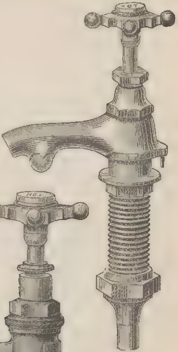


Fig. 217.

Screw-down Bason Cock.

For Tip-up Bason, lettered Hot or Cold.

$\frac{1}{2}$, $\frac{3}{4}$, 1 inch.

Fig. 218.

Gun-metal Bath Cock,

Lettered Hot or Cold.
Polished or Nickel Plated.

$\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.

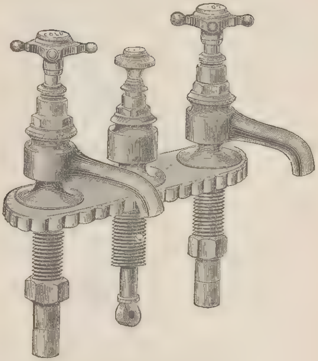


Fig. 219.

Combined Bath Cock,

Lettered Hot and Cold. Nickel Plated or Polished.

$\frac{3}{4}$, 1 inch.

Fig. 220.

Screw-down Bason Cock,

For Tip-up Bason, Lettered Hot and Cold.

This Valve can be fitted with any design of top. It is fitted with Patent Fibre Washer, Raised Seat, and Rotary Valve for hot water.

Made in best gun-metal, and very highly finished.

⅜, ½, ¾, 1 inch.

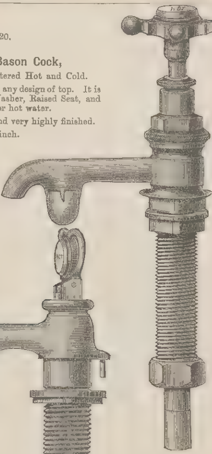


Fig. 221.

Self-closing Cam Action Bason Cock,

For Tip-up Bason, Lettered Hot or Cold.

½, ¾ inch.

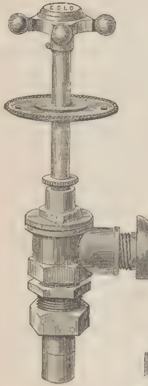


Fig. 222.

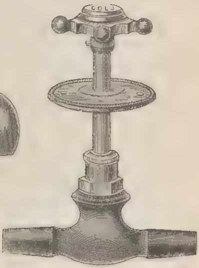


Fig. 223.

High-pressure Screw-down Bath Cock.

$\frac{3}{4}$, 1 inch.

The working parts and all parts exposed, when fixed, are made in Gun-metal.

High-pressure Stop Cock, with Long Spindle and Plate.

$\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1 inch.

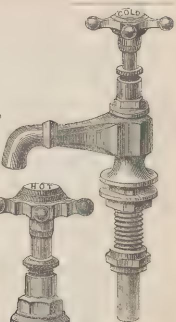
Polished or Nickel Plated.

Fig. 224.

Bason Cock,

Hot or Cold—⅜, ½ inch.

Length of Nose from centre to underside of Bib, 2⅛, 2½, 3⅝ inches.



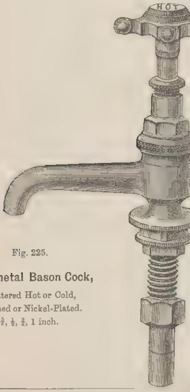


Fig. 225.

Gun-metal Bason Cock,

Lettered Hot or Cold,
Polished or Nickel-Plated.
⅜, ½, ¾, 1 inch.

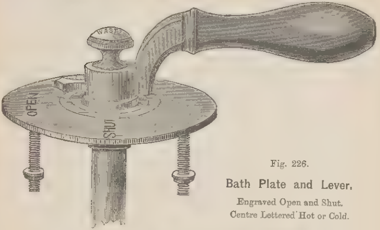


Fig. 226.

Bath Plate and Lever.

Engraved Open and Shut.
Centre Lettered Hot or Cold.

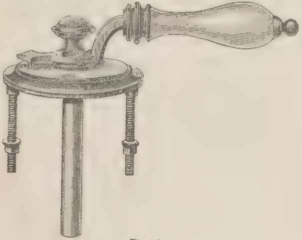


Fig. 227.

Bath Plate.

Plates engraved Open and Shut, China Centres lettered Hot or Cold.

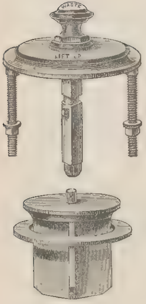


Fig. 228.

Waste Knob with Valve

To suit Fig. 227.

Fig. 229.

Shower,

With Cast Iron Bracket, Iron Tube, and Copper Shower.

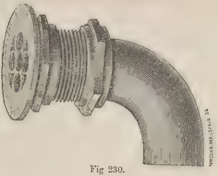


Fig 230.
Bath Overflow.
1¼, 1½, 2 inch.

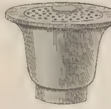


Fig. 231.
Lead Sink Trap,
With Brass Bell and Grate.
2, 2½, 3, 3½, 4 inch.

Fig. 232.
Cast-iron Sink Trap,
With Brass Grate.
4, 4½ inch.

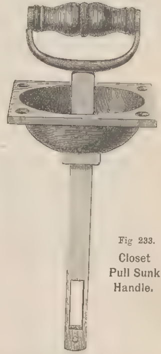


Fig 233.
Closet Pull Sunk Handle.

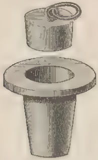


Fig. 234.

Ring Plug and Washer.

½, ¾, 1, 1¼, 1½, 1¾ inch.

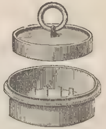


Fig. 235.

Bath Plug and Washer.

1, 1¼, 1½, 1¾, 2, 2½, 3 inch.

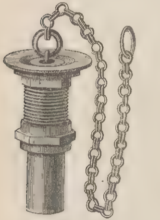


Fig. 236.

Bason Plug and Washer.

½, ¾, 1 inch.

If required with Chain as sketch, extra according to length required.

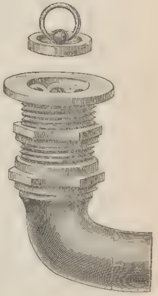


Fig. 237.

Bath Plug and Washer.

1¼, 1½, 2 inch.

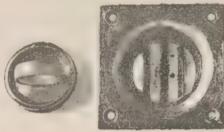


Fig. 238.

Square Tub Plugs and Washers.

1½, 1¾, 2, 2½ inch.

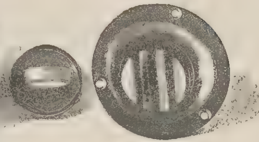


Fig. 239.

Round Tub Plugs and Washers

1½, 1¾, 2, 2½ inch.

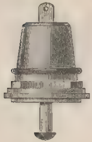


Fig. 240.
Round Closet Valve.
1, 1¼, 1½, 2, 2½ inch.

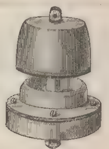


Fig. 241.
Round Closet Valve.
1¼, 1½, 2, 2½, 3 inch.

Fig. 242.
Spindle Valve.
2, 2½, 3, 4 inch.

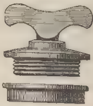


Fig. 243.
Trap Screw, with T top.
¾, 1, 1¼, 1½, 1¾, 2 inch.

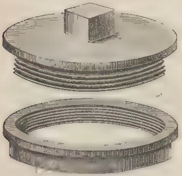


Fig. 244.
Trap Screw.
¾, 1, 1¼, 1½, 1¾, 2, 2½, 3, 4 inch.

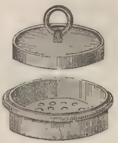


Fig. 245.
Table Plug and Washer.
¾, 1, 1¼, 1½, 1¾, 2, 2½, 3 inch.

Fig. 246.

Straight Ferrule,

For Lead Pipe, Ground Joint.
½, ¾, 1, 1¼, 1½, 2, 2½, 3 inch.

Fig. 247.

Straight Ferrule,

For Iron Pipe.
½, ¾, 1, 1¼, 1½, 2, 2½, 3 inch.

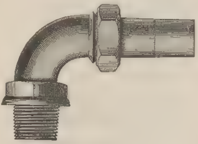


Fig. 248.

Bent Ferrule,

For Lead Pipe, Ground Joint.
½, ¾, 1, 1¼, 1½, 2, 2½, 3 inch.

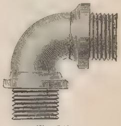


Fig. 249.

Bent Ferrule,

Male Ends, for Iron Pipe.
½, ¾, 1, 1¼, 1½, 2, 2½, 3 inch.

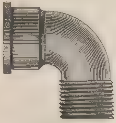


Fig. 250.

Bent Ferrule,

For Iron Pipe.
½, ¾, 1, 1¼, 1½, 2, 2½, 3 inch.

Fig. 251.

Straight Connection,

For Lead and Iron.
½, ¾, 1, 1¼, 1½, 2, 2½, 3 inch.

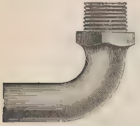


Fig. 252.

Bent Connection,

For Lead and Iron Pipe.

$\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.

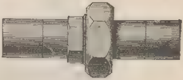


Fig. 253.

Plumbers' Union.

$\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3 inch.

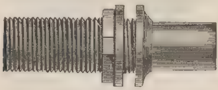


Fig. 254.

Boiler Joint.

$\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2 inch.

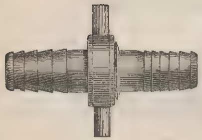


Fig. 255.

Hose Union.

$\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, 4, 5, 6 inch.

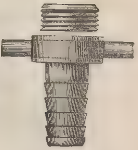


Fig. 256.

Nut, Ring and Tail.

$\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3 inch.

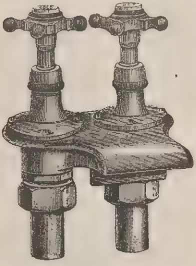


Fig. 257.

Double Toilet Cock,

Marked Hot and Cold. Sizes ¾ and 1 inch.

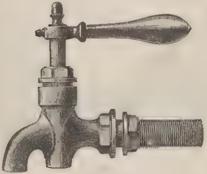


Fig. 258.

Urn Cock.

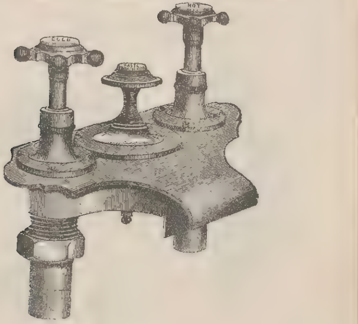


Fig. 259.

Double Toilet Cock,
With Waste. Sizes $\frac{3}{4}$ and 1 inch.

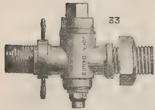


Fig. 260.

Tank Cock,
With Union for Hose.
1, $1\frac{1}{4}$, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3 inch.

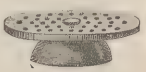


Fig. 261.

Bell Trap Cover.

FOUNTAIN JETS.

Fig. 262.

Fig. 264.

Fig. 265

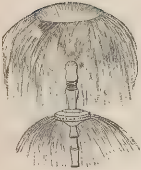


Fig. 263

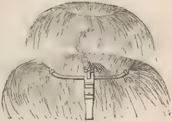


Fig. 266.

FOUNTAIN JETS—(*Continued.*)

Fig. 267.

Fig. 268.

Basket and Ball

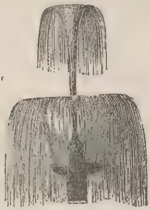


Fig. 269.

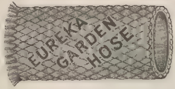


Fig. 270.

Eureka Garden Hose.

This is a first-class cheap Hose, and we can recommend it.
Sizes, ½, ¾ and 1 inch.

Fig. 271.

Garden Hose Reel.

Made in two sizes, large and small.

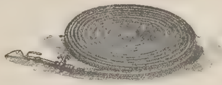


Fig. 272.

Garden Hose.

We keep a very large stock of all kinds of Garden Hose always on hand, and are prepared to fill orders of any magnitude.

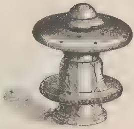


Fig. 274.

Dwarf Sprinkler.

Screwed for $\frac{1}{2}$, $\frac{3}{4}$ or 1 inch pipe, and for $\frac{3}{4}$ and 1 inch Directors.

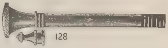


Fig. 275.

Director,

With Rose and Jet.
Sizes, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ and 1 inch.

Fig. 273.

Lawn-Sprinkler Stand.

Sizes, $\frac{1}{2}$, $\frac{3}{4}$, 1 inch.

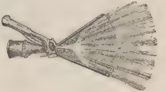


Fig. 276.

Spreader.

Suitable for $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1 inch Directors.

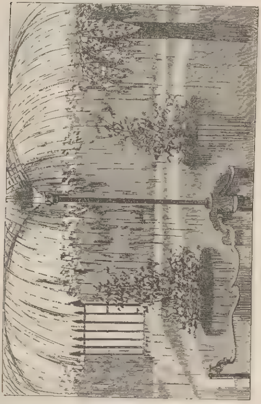


Fig. 277.

New Perfection Lawn Sprinkler.

We can supply these at 6s. each, ½-inch size.

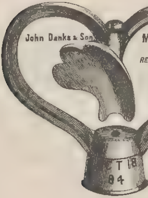


Fig. 278.

Butterfly Sprinkler.

Cheap and reliable.
Sizes, ½ and ¾ inch, to suit Directors or Iron Pipe.

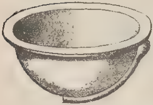


Fig. 279.

Plug Overflow Bason.

White, Marble or White and Gold.
Sizes, 13, 14, 15, 16 and 18 inch.

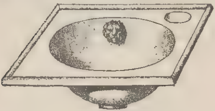


Fig. 280.

Small Square Cabinet Bason.
White, Marble, or White and Gold.

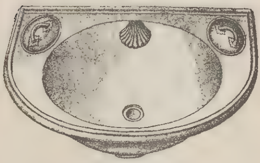


Fig. 281.

Round-fronted Cabinet Bason.

White, Marble, or White and Gold.

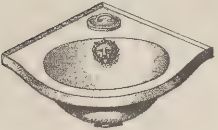


Fig 282.

Angular Cabinet Bason.

White, Marble, or White and Gold.

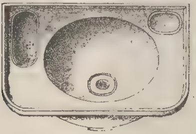


Fig. 283.

Round-cornered Cabinet Bason.

White, Marble, or White and Gold.

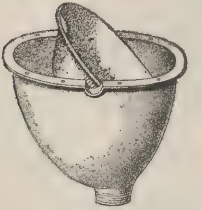


Fig 284.

Tip-up Bason.

Sizes, 14 and 16 inch.
White, Marble, or White and Gold.

We have supplied hundreds of these in Melbourne, three hundred and sixty being used in Prell's Buildings.

Fig. 285.

Sinks.

Black Galvanised and Enamelled.
All sizes in stock.

Fig. 287. Closet Bason.

Fig. 288. Hopper.

Fig. 286.

Angle Urinal.

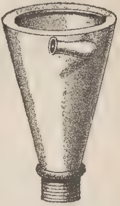


Fig. 289. Hopper.

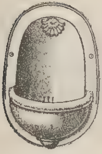


Fig. 290.

Cradle Urinal.

Fig. 291.

Flat-back Urinal

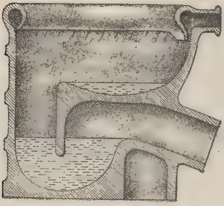


Fig. 292.

Wash-out Closet.

Fig. 293.

Cast-iron Bath.

Sizes, 5 and 6 feet.

Paint Enamelled and Porcelain Enamelled.

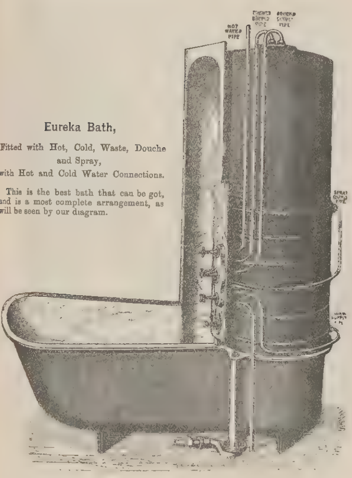
A very large stock always on hand.

Fig. 294.

Citizen Bath,

Fitted with Hot, Cold, and Waste.

A really good bath.



Eureka Bath,

Fitted with Hot, Cold, Waste, Douche and Spray, with Hot and Cold Water Connections.

This is the best bath that can be got, and is a most complete arrangement, as will be seen by our diagram.

Fig. 295.

Fig. 296.

Eureka Bath,
Fitted in wood work.

The woodwork of this bath is of the very best description, and the whole thing is a thoroughly workmanlike job. This class of bath is used in the best class of houses, the leading hotels and clubs.

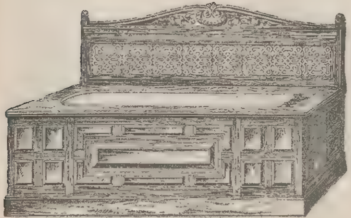


Fig. 297.

Fig. 297 shows our system of fitting up baths. We fit them up in any kind of wood, and if necessary to architects' designs. We are particularly careful about the woodwork; and orders entrusted to us receive every attention.

Fig. 298.

Folding Lavatory.

We have supplied many of these to the leading banks and offices. They are much appreciated.

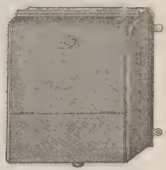


Fig. 299.

Folding Lavatory,

Closed.

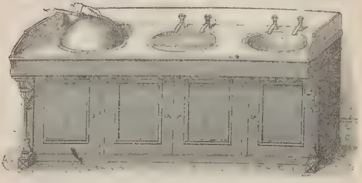


Fig. 300.

Tip-up Basons in Slab.

Any number of Basons may be fitted up in one range; are much used in clubs, hotels, and offices. The plain Plug Bason, Fig. 279, is often fitted up in the same manner.

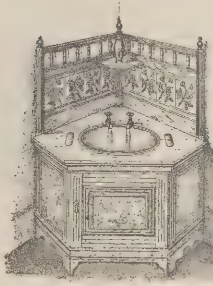


Fig. 301.

Angle Lavatory.

A beautiful piece of Furniture for the Bath, Bed or Dressing Room.

Made in any kind of wood, and to special designs if necessary.

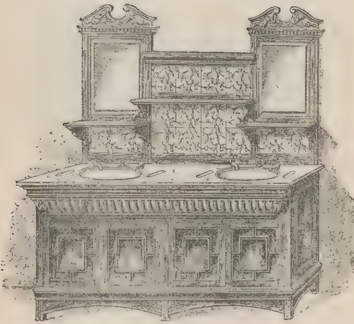


Fig. 302.

Double Lavatory.

Made in any wood to suit the Furniture of the Bath, Bed, or Dressing Room.

This is a beautiful piece of furniture, the whole of the woodwork being of the very best workmanship and design.

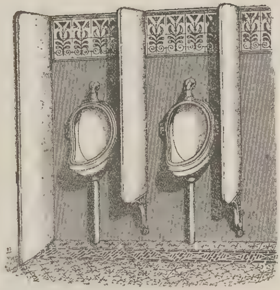


Fig. 303.

Range of Urinals.

Fitted with Slate or Marble divisions and back, and inlaid with Tiles.
As will be seen, any number of Urinals may be fitted in one range.

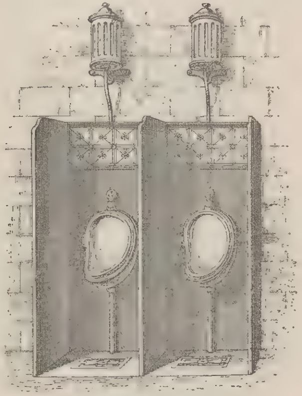


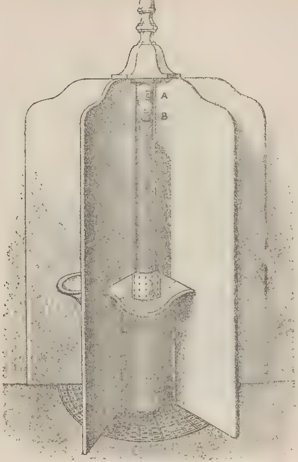
Fig. 304.

Double Urinal,

With Automatic Flush-out.

Can be supplied either of Enamelled Slate or Marble.

These urinals are very effective, the flush-out arrangement being a great improvement on a continuous supply of water.



PLAN.

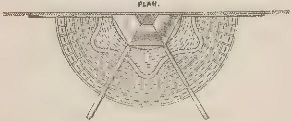


Fig. 305.

Fig. 305.—This arrangement of Urinals is very suitable for confined places. We supply it as shown, or with the complete circle of six bays; it is much in demand for railway stations, offices, hotels, clubs, etc.

Sheet Lead Rolls.

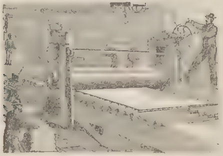


Fig. 306.

Sheet Lead.

We have paid every attention to this large and increasing portion of our business. Our machinery is of the latest type, and is capable of turning out Sheet Lead of the very best quality. Our rapidly-increasing home and export trade is very flattering to us; and our clients may rely upon our continued efforts to deserve the continuance of their orders. Herewith we give the sizes of sheets of ordinary weights of sheet lead.

Lead, 2½ lbs. per square foot is rolled in sheets 25 ft. x 7 ft.
Lead, 3, 4, and 5 lbs. per square foot is rolled in sheets 30 ft. x 7 ft.
Lead, 6, 7, 8, and 10 lbs. per square foot is rolled in sheets 40 ft. x 7 ft. 6 in.
Heavy lead can be rolled in sheets 40 ft. x 7 ft. 9 in. from ¼ to 1 in. thick.

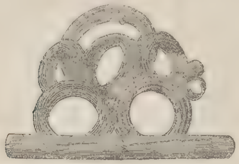


Fig. 306A.

Sheet Lead and Lead Pipe.

Lead Pipe.

We have long made a specialty of Lead, Compo., and Tin Pipe, and manufacture each of these lines in very large quantities, and always hold a good stock in hand. We also make a specialty of Tin-lined Lead Pipe, which is useful for many purposes. We are pleased to call especial attention to the uniformity of bore and finish, internally and externally.

The following Tables of Weights, etc., will no doubt prove useful, as will also the diagrams of comparative sizes on the following pages :—

LEAD PIPE.

Diameter of bore in inches.	Description of pipe.	Weight per yard in lbs.	Length of coil in feet.
½	Beer	3	112
½	Light	4½	72
½	,,	5	66
½	Heavy	6	56
⅝	Light	5	66
¾	,,	5	66
¾	,,	6	56
¾	Medium	7	48
¾	,,	8	42
¾	Heavy	9	50
1	Light	7	48
1	,,	9	50
1	Heavy	12	37
1¼	Light	9	50
1¼	,,	10	45
1¼	Heavy	17	44
1½	Light	11	50
1½	,,	13	50
1½	Medium	16	47
1½	Heavy	20	42
1¾	Medium	17	44
1¾	Heavy	21	40
2	Light	17	40
2	Medium	20	40
2	Heavy	25	33
2	,,	28	30
2	,,	31	30
2½	Light	21	25
2½	Medium	27	25
2½	Heavy	29	25
2½	,,	37	20
3	Light	24	20
3	Medium	31	20
3	Heavy	34	20
3	,,	40	In 10 to 16ft. as required.
3½	Light	27	
3½	Heavy	40	
4	Light	20	
4	Medium	40	
4	Heavy	60	

COMPO. PIPE.

Diameter of bore in inches.	Description of pipe.	Weight per yard.	Length of coil in feet.
¼	Special.	10oz.	288
⅜		14oz.	200
⅜		11½oz.	250
½		1½lb.	120
⅝		2¼lb.	78
¾		2¾lb.	64
1		5lb.	72

TIN PIPE.

Size.	Diameter in inches	Weight per yard.
⅜	Outside.	5oz.
⅜	,,	7½oz.
⅜	Bore.	9oz.
½	,,	10oz.
½	,,	1lb.
½	,,	10oz.
½	,,	1½lb.
⅝	,,	13oz.
¾	,,	1lb. 14oz.
¾	,,	2lb.
¾	,,	3lb.
1	,,	3¼lb.

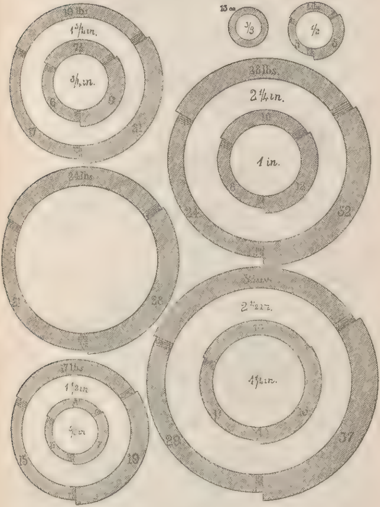


Fig. 307.

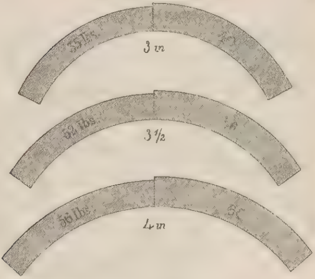


Fig. 307A.

Figs. 307 and 307A, Lead Pipe, showing the different thickness and weight per yard Full size drawings.

Fig. 308. Fig. 309. Fig. 310. Fig. 311.

Fig. 312. Fig. 313. Fig. 314.

Lead Traps.

Fig. 308. S Trap.
Fig. 309. Half S Trap.
Fig. 310. P Trap.
Fig. 311. 4. Running Trap.
Fig. 312. Short Bend.
Fig. 313. Long Bend.
Fig. 314. Bag Trap.

These Traps are beautifully made without seam or joint. They are made in the same manner as ordinary lead pipe, and are most serviceable and secure. We have supplied these traps in very large quantities to many of the large buildings in Melbourne and Sydney, and have never received a complaint against them.

Main Clips, fitted with Ferrule Stop.

Fig. No. 315.

Wrought-iron Clips for Main Pipes, as recommended by the Board of Land and Works, to prevent the mains being damaged or fractured through tapping. We are prepared to supply them from 2 inch up to any size required with Ferrule Stop Cock, fitted as shown; also, complete equipment of tools for tapping, viz.:—

Tapping Frames, with Chain.
Steel Drills, in sizes—½, ¾, 1, 1¼, 1½, and 2 inches.
Rymer and Tap combined—½, ¾, 1, 1¼, 1½, 2 inches, and
Ratchet Braces.

ATMOSPHERIC ELECTRICITY.

THE IDENTITY OF ELECTRICITY AND LIGHTNING.

The honour of this discovery belongs to Franklin. The picture of Franklin and his little boy flying the kite which first drew lightning from the clouds will be regarded with interest to the latest ages of the world. For the information of our readers who may not be conversant with the incident, we will attempt to briefly narrate it as follows :—

In 1749, Franklin, observing lightning to possess almost all the properties observable in electric sparks, suggested that the electric action of points which was discovered by him, might be tried on thunderclouds, and so draw from them a charge of electricity. He then proceeded to experiment in the following manner. Having made a kite with points fixed to it and in order to insulate the electricity which might pass down the hempen cord, it being a partial conductor, he attached a silken cord to its extremity, where he placed a key, from which he expected to obtain sparks of electricity. Afraid of being laughed at should his experiment fail, he took his little boy with him, to make it appear as if he were going to assist the boy in flying his kite. Having raised their electrical kite in the air, they waited a long time before any indications of electricity could be seen. At length a storm passed over, when he found the wetted string to conduct electricity to the earth, and to yield abundance of sparks, and causing the fibres of the hempen cord to stand erect by electric repulsion. Here he had made one of the most brilliant discoveries in the whole range of physical science ; he had discovered the identity of lightning and electricity.

Lightning Conductors.

Lightning falling upon buildings chooses by preference the points which are the best conductors. It sometimes strikes and destroys objects which are non-conductors, but this happens generally when such bodies lie in its direct course towards conductors. Thus lightning has been found to penetrate a wall to a mass of metal placed within it. Metallic roofs, beams, braces, and other parts in buildings are liable thus to attract lightning. The heated and rarified air in chimneys acquires conductibility; hence it happens that often lightning descends chimneys and thus passes into rooms. It follows bell wires, metallic mouldings of walls and furniture, and fuses gildings. The purpose of paratonnerres, or conductors erected for the protection of buildings, is not to repel, but rather to attract, lightning and divert it into a course in which it will be innoxious.

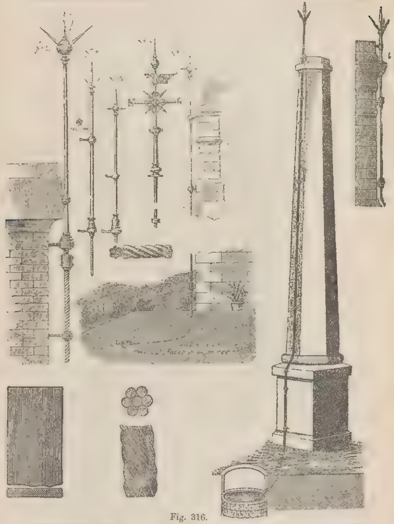


Fig. 316.

Showing our system of fixing lightning conductors to church steeples, shot towers, chimney stacks, warehouses, stores, mansions, and private dwellings. A brief explanation may be of some use to our clients whose business it is to fix them.

Our paratonnerres are made of a pointed metallic rod, the length of which varies with the building on which it is placed. It is erected vertically over the object it is intended to protect. From its base an unbroken series of metallic bars brazed or welded together end to end, or a wire rope is continued to the ground, where it is buried in moist soil or, better still, immersed in water, so as to facilitate the escape of the fluid which descends upon them. The most important thing about the erection of a lightning conductor is to have its lower end thoroughly connected with the earth. If water or moist soil cannot be conveniently found, it should be connected with a sheet of metal of considerable superficial magnitude buried in a pit filled with powdered charcoal. The connection to the metal plate should extend well over it; in the case of wire rope it may be untwisted, threaded in and out of the sheet copper, so as to make a large contact, and then well brazed. The copper strips may be split and radiated over the sheet in like manner.

Necessary Conditions for Lightning Conductors.

1. Good continuous conduction. 2. Ample earth contact, capable of being frequently examined. 3. Termination in points not subject to corrosion. 4. No portion of the building outside the limits of the conductor to be without a point connected to the conductor. 5. No large masses of metal or gas pipes should be within striking distance of the conductor. Copper is five times as good a conductor as iron. The French use copper wire ropes 0.4 to 0.8 inch diameter for each 82 feet of height. Copper strips No. 11 B.W.G. and 4 inches wide are used for conductors for factory chimneys in Lancashire. For St. Paul's Cathedral, eight copper wire ropes ½ inch diameter are used. Copper strips when used should have the joints carefully brazed. It is generally estimated that the range of protection of a conductor is a circle round its base whose radius is two or three times its length.

Electric Bell Fittings.

To enable those of our customers, who have little or no knowledge of electricity, to fit up Electric Bells without special assistance, we think it well to append to our Catalogue full instructions upon the subject, and at the same time to include a few remarks respecting the nature of electricity, the methods of producing it, and the uses to which it is put. Electricity is an agent which produces heat, light, and magnetism; and provided a suitable conducting medium is supplied, can travel at the same rate as light. There are many methods of producing electricity; but there are only three in use at present for its application to domestic or commercial purposes, viz.:—

1st. By chemical action.
2nd. By means of magnetism combined with mechanical action.
3rd. By friction.

The advantages of electric-bell communication are now so well known and appreciated that we need not dwell upon them; their superiority in every respect over the crank, pneumatic, and spring bells have been proved over and over again. The ease with which instant communication can be made between distant points in houses, towns, or ships, commend it to all as a great convenience, and prove it to be perfectly reliable, efficient, and economical. The material we supply is the very best that can be obtained; and, with our experience of many years, enables us to guarantee every satisfaction. Our system of equipping mansions, private dwellings, and offices comprises:—

1st. Instant communication from one place to another irrespective of distance.
2nd. Security against the attacks of fire or burglars.

INSTRUCTIONS FOR ELECTRIC BELL WORK.

Description of Wires.—It is of the utmost importance that all wires used for Electric Bell purposes be of pure copper and thoroughly well insulated. The material mostly employed for insulating purposes is indiarubber or guttapercha, or cotton saturated with paraffine. For ordinary indoor work, in dry places, and for connecting doors and windows with burglar alarms, or for signalling in case of fire, cotton-covered wires answer very well, but for connecting long distances part or all underground, or along walls, or in damp cellars or mouldings, guttapercha covered wire is required, but it should be fixed where it will not be exposed to heat or sun, or in very dry places, as the covering so exposed will perish, crack, and in time fall off. This may, however, be prevented by it being covered with cotton.

Battery Wires.—For ordinary housework, we prefer to lay a wire of No. 18 or 20 copper, covered to No 14 or 13 with guttapercha and an outer covering of cotton, which we call the battery wire (see dotted lines of diagram), or the wire which conveys the current from the battery to every press button, no matter how many or in what position; and here we may note, that all copper wires covered with guttapercha should be left clean and uncoated with tin, while all copper wires to be covered with indiarubber, should have a coating of block tin.

Line Wires.—The wires leading from the pushes to the bell or signalling apparatus (see plain lines on diagram), we call the line wires, and may be indiarubber covered. The reason for selecting the two kinds, is that with the gutta percha wires, the joints may be more perfectly covered and made secure against damp This is of the utmost importance in the case of battery wires, as the current is always present and ready to take advantage of any defect in the insulation to escape to an adjoining wire or to earth, and so cause a continuous waste of the battery.

For the rest of the house wires the perfect covering of the joints is not quite so important, though these should be thoroughly covered, as the current is only present in these wires during the time the finger is upon the button and the bell ringing For line wires we usually prefer No. 20 copper covered with indiarubber and an outer coating of cotton well varnished.

In a new building the wires must be contained within zinc bell tubes. A 5-16th tube will hold two wires comfortably.

Wires in Tubes.—The tubes should be fixed to terminate in the same positions in the rooms as ordinary crank bell levers, that is about 3 feet from the floor; and at the side of the fire-place a block of wood should be fixed in the wall before any plaster is put on, and the top of the tube terminate in the centre of same. A large nail or screw may be put in to mark the place, so that the top of the tube may be found easily when the plastering is finished, bend the tube slightly forward at the top, and insert a short peg of wood to prevent dirt getting down the tube.

If the tubes are kept clear, the wires will easily be drawn up or down as may be required. The best way is to get a piece of ordinary copper bell wire sufficient to pass through the tube, and having stretched it, pass it through and out at the other end; here have your coils of insulated wire, viz, one battery wire which is branched off to every push, and one line wire which has to go direct to the indicating box and having removed a short portion of the insulation, they are tied to the length of wire and drawn through. This is repeated wherever a push is to be fixed throughout the building. The interior of every push consists of two springs, A and B—see

engraving; the ends are brought through the back and a short portion of the insulation removed and attached to the springs by binding the ends under the screws, as shown. Great care must be taken not to remove too much of the insulating material so as to leave the wire naked outside or at the back of the push. It will occur to anyone the need of seeing that the wires are not drawn tightly up to the sharp edge of the tube itself.

When the position of the bell and signals is decided upon, tubes must be fixed from the position required to the cellar, or roof, or floor above, as may be required. For this purpose $\frac{3}{8}$ tubes may be used; each tube will contain three wires. One extra tube must always be fixed to contain the wire from the battery, if it should pass that way, and the wire from the bell back to the battery, which is mostly fixed in the cellar.

Joining Wires.—In joining the battery wires, the place where union is to be made must be carefully uncovered for a distance of about $\frac{3}{4}$ of an inch, the ends of the wires to be joined well cleaned, and tightly twisted together; get fine solder in strips, and with the flame of a candle or spirit lamp heat the joint sufficient to melt the solder when held on it, having first put a little powdered resin on it as flux; see the solder runs well and firmly adheres to the copper wire, then take a piece of gutta-percha and place upon it while warm, and with the aid of the spirit lamp and wet fingers mould it round until a firm and perfect covering has been formed.

With the line wires it is best, as far as possible, to convey it all the way from the push to the signal box in *one* length; of course when two or more pushes are required to the same wire, a junction is unavoidable. The same process of joining and covering as given for the battery wires applies to the line wires.

Where a number of wires are to be brought down to one position, a large tube or wood box may be used to advantage.

Stapling the Wires.—In no case should a wire be left naked. When they pass along a damp wall it is best to fix a board and *loosely* staple them. In no case allow more than one wire in the same staple, and do not fix the staples to touch each other. Many a house of electric bells has been an incessant annoyance and complete failure through driving the staples tight up to the wires and several wires in the same staple—this must not be done on any account. A number of wires may be twisted into a cable and run through a short piece of gutta-percha tube and fastened with ordinary gas hooks where it is an advantage.

In running the wires avoid hot water pipes, and do not take them along the same way as plumbers' pipes.

Underground Wires.—Underground wires must be laid between pieces of wood, or in a gas pipe, and not exposed in the bare earth without protection, as sharp pieces of stone are apt to penetrate the covering and cause a loss; in fact, in this, as in every part of fixing wires, the best wire and the best protection is by far the cheapest in the end.

Methods of Laying Wires.—We will now proceed to explain diagrams of different modes of laying wires. Almost every job will require some little modification of the plans we have sketched, but we have endeavoured to cover any purpose for which communication can be required.

Note.—When the communication is too far distant to fix a return wire to the battery, the terminal wire at the distant end and the wire attached to the zinc rod at the sending end of the wire, may each be carried to a gas or water pipe and soldered to the same, thus dispensing with one wire. (See diagram No. 5.) In all cases the letter E means the wire to be carried to a gas or water pipe, or if neither can be had, a plate of metal must be buried in moist earth or a well of water and the wires attached to it.

Diagram No. 1.—Shows the arrangement of wires for a single bell of indefinite length; door triggers are fixed same way, only the trigger over the door is substituted for a push.

Diagram No. 2—Shows arrangement for two press buttons to ring the same bell; *any* number of pushes may be arranged to ring the same bell on this plan. Thief detectors are coupled in the same manner. Any number of detectors to doors and windows may thus be connected so as to ring the same bell.

Diagram No. 3—Is arranged for one push to ring two bells. The bells may be a distance apart as in separate rooms; it is not well to couple more than 3 or 4 bells in one circuit, it is better to have another push and wires if a larger number are required. Whenever a number are required to ring simultaneously we construct them purposely, and such should be specified when the order is given.

Diagram No. 4—Shows a bell to continue ringing until stopped. The wires are the same as No. 1, but with an additional wire from the battery direct to the bell. These are used as thief detectors or calling servants; the bell continues to ring until the little lever at the side is moved, which has the effect of stopping the bell and restoring the connection with the press button.

Diagram No. 5—Is a plan for ringing to a distance as in works, or from one building to another; the wire may be carried underground or overhead, and the wires at each end connected with the gas or water mains. Distance is no object, but the bells used for this purpose must have finer wires upon the coils, hence in ordering, care should be taken to mention that the bells are required to work a long distance.

Diagram No. 6—Is for a continuous ringing bell at a long distance; only one wire is required between the places of communication, but an extra battery is placed at the distant end to continue the action of the bell after the sender has signalled.

Diagram No. 7—Is a means of communication and reply. Both ends are exactly alike, and signals may be sent either way upon the same wire; a battery is required at each end, also a Morse key instead of an ordinary push; the line wire may be galvanised iron overhead or insulated wire underground.

Diagram No. 8—Is a plan for transmitting signals in both directions with a battery at one end only, and with ordinary press buttons; the whole of the wires must be insulated

Diagram No. 9—Shows the mode of signalling in both directions with a battery at one end only. Morse keys are required by this plan. Both wires should be insulated and carried underground.

Diagram No. 10.—This shows the whole system of running the wires through a building with the indicator bell and battery attached. The dotted lines are the battery wires, the plain lines the wires between the push and the signal box. Following the directions of the arrow it will be seen the push has been pressed in at No. 2, and the current has passed through No. 2 signal and caused it to appear, and through the bell calling attention, and on back to the battery. The two

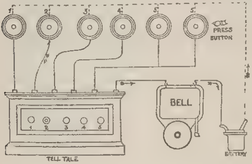


Diagram No. 10.

pushes, 5, 5, are connected so as to move the same signal. Most of the better rooms in a house, as drawing, dining, and breakfast rooms, have a push at each side of the fireplace; these are connected as at 5, 5. Single pushes, or bed pulls, or doors, are connected as the other numbers.

SEPARATE BELLS.—To fix separate bells, viz., bells to ring in other parts of the building, take a branch out of the nearest *battery wire* to the push or pull, next carry a wire from the push to the bell and from the bell back to the zinc end of the battery.

When the wires from the press buttons are connected with the binding screws on the top of or inside the indicating case, the insulating material must be carefully removed and the wires *cleaned and well clamped down*, the binding screw at the extreme right hand is the one to which the wire leading to the bell is attached (see diagram 10). This applies to all electric signal cases whether pendulums or drop indicators.

TO CONNECT THE CELLS TOGETHER.—The number required should be placed side by side, the necks of the bottles all in one direction thus—

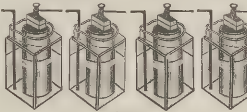


Fig. 317.

Attach the loop of the zinc rod of one cell to the carbon plate projecting above the porous cell of the next, and so on; a zinc rod forming the terminal pole at one end, and the screw of the carbon plate the other end of the series: See Fig. 317. Be sure the wire loop and the binding screws are perfectly clean at the point of contact, and well clamped down.

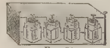


Fig. 318.

We supply a deal box, conveniently arranged for holding the cells, fitted with binding screws for attaching the wires. Fig. 318 shows the lid and front removed.

TO CHARGE THE BATTERY.—Having fastened all connections, put the charge of salammoniac into each glass jar, and add water until the jar is three parts full. The battery must stand a few hours before its full strength is reached, but if it is important to have a full current immediately, a pin hole must be pierced through the bottom of each porous cell before the battery is put together, so as to allow the solution to rise within and saturate the contents of the porous cell. If the outer cells are allowed to get wet or overflow, it will cause local action.

NUMBER OF CELLS.—One No. 1 only for working small bells a short distance, one No. 2 or 3 for larger bells a short distance. Four to six cells, No. 1 or 2 size, are required to work bells and indicators, according to number. For large hotels, workhouse, infirmary, or asylums, six No. 3 cells are recommended, though the smaller size will do.

TO RENEW THE CELLS.—If the battery shows signs of weakness, add a new charge of salammoniac; should it not revive, take it to pieces, wash clean, re-charge with salammoniac, scrape the zincs clean; if no improvement then takes place, new porous cells must be substituted for the old ones.

Electric Indicators.

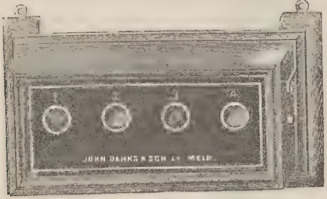


Fig. 319.

Indicators are fixed in hotels and large houses, in order to tell the servants from which room the bell has been rung. Our Indicators are certain in their action, require little or no adjustment, have no permanent magnets, can be worked with small battery power, and are of handsome appearance and moderate cost. Made in sizes from 2 to 50 hole.

Fig. 320.

Electric Bells.

We supply Electric Bells of various descriptions, known as the Skeleton, Trembling, Continuous Action, and Single Stroke Bells, mounted on iron frames in stained and polished mahogany or walnut cases, double coils wound with silk covered wire, platinum tipped steel springs, and nickel plated gongs, in sizes from $2\frac{1}{2}$ inches to 6 inches.

Fig. 321.

Electric Switches.

Switches are used either to break the current or to give it a different direction as required.

Electric Batteries.

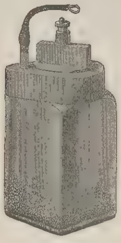


Fig. 322.

Leclanche Battery.

Fig. 323.

Bichromate Battery.

Batteries can be divided into two series :—

1. Those using salts as exciting fluid, which include the Leclanche.
2. Those using acids as exciting fluid, including the Bunsen, the Grove, the Bichromate of Potash, etc. The former are suited and generally used for bell work, as they do not waste when not in action, and can be left without attention for a long time. They are, however, not suited for constant work, such as electric lighting, etc.

The construction of the Leclanche Battery is as under :—

Negative Element: Carbon surrounded by Peroxide of Manganese and Coke enclosed in a porous pot.
Positive Element: Zinc.
Exciting Fluid: Salammoniac, about 2 oz. to 1 pint of water; Electro Motive Force, 1·55 volts.

USE.—Fill the outer glass jar about two-thirds full with the salammoniac solution, and leave for a few hours.

Construction of the Bichromate Battery :—

Negative Element: Carbon.
Positive Element: Zinc.
Exciting Fluid, mix as follows: Dissolve 3 ozs. of bichromate crystals in one pint of water, then pour in slowly 6 ozs. of Sulphuric Acid; Electro Motive Force, 2 volts.

The latter are used for experiments, motive power, and electric lighting, and give large currents, but as they require constant attention and waste the zincs (unless taken out of the fluid) even when not in use, they are not suited for Electric Bell work.

The Galvanometer.

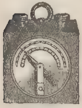


Fig. 324.

The Galvanometer is a contrivance by means of which the amount of electricity that is flowing through a circuit at any given time may be easily measured. In the Galvanometer we measure the amount of current passing by observing the extent to which the magnetic needle is deflected. It is also very useful to electricians in detecting a break or fracture in the wire by simply attaching it to the wires. If the current of electricity be sufficiently strong the needle will be deflected in the direction of the current, and the faulty spot quickly discovered.

Electric Wires.

Our Electric Wires for Bells, Telephones, etc., are all Copper, and are guaranteed to be of high conductivity and perfect insulation for the purpose stated. The sizes mostly used for bell wire are No. 22 or No. 20 B.W.G.

LINE WIRES FOR HOUSE AND INDOOR USE.

No. 22 Copper Wire, double cotton covered and paraffined.
No. 20 " " " " "
No 22 " " indiarubber and double cotton covered, and paraffined.
No. 20 " " " " " " "

DOUBLE LINE WIRES.

No. 22 Wire, indiarubber covered and cotton covered, then cotton covered and paraffined.
No. 20 Wire, indiarubber covered and cotton covered, then cotton covered and paraffined.
Stranded silk covered Wire, for use with moveable pushes, in two or three strands.

Electric Pushes and Pulls.

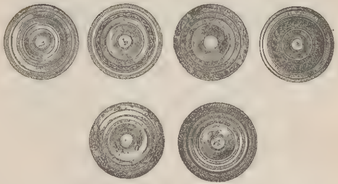


Fig. 325.

We stock Pushes suited for every requirement, and keep a very large assortment of all the patterns. They should be selected to suit the place where they are to be fixed, for instance, wood or china pushes in the drawing-rooms, pear pushes and pressers in the bedrooms, water-tight metal pushes for outdoor work, etc. May be had to suit any furniture.

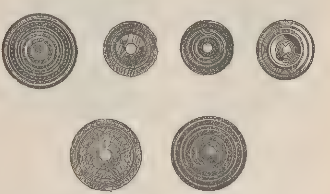


Fig. 326.

We mention a few of the Pushes we have, viz., Wood, Boxwood, Walnut and Cocos; China Pushes, with best seasoned wood backs, warranted not to shrink; China Pushes, with metal backs; Pear-shaped Pushes, attached to flexible silk wires so that they can be moved about from one place to another, for use in bedrooms, on the dining table, etc.

Fig. 327.

Switch.

Fig. 328.

Pear Presser.

Door, Window and Floor Contacts.

These afford the best means of securing doors or windows against the attack of thieves. We have fitted them to a great many houses, stores, safes, fowlhouses, etc., and have in all cases given satisfaction. These contacts are usually fitted in connection with our continuous ringing bell, and require a switch in connection to break the current when the bells are not required to ring.

Fig. 329.

Floor Contact.

Fig. 330.

Door or Window Contact.

Fig. 331.

Door or Window Contact.

ELECTRIC PULLS.—It being necessary for good bell work that outdoor contacts should be water and dust resisting, we only supply the best quality for the purpose. May be had either oblong or round, and almost any design that could be wished for.

Speaking Tubes.

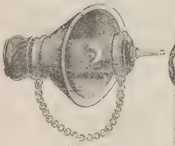


Fig. 332.

Mouth Piece and Whistle with Indicator.

Fig. 333.

Speaking tubes are being extensively used in large factories and warehouses, and have proved to be an important factor in the carrying on of business expeditiously. The advantages derived from their uses are obvious in almost an instant. A person on the ground floor of a building can communicate with another, say on the top story, or any other place, or at a distance, saving a considerable amount of time and bodily exertion. We can supply them for a single room, or for any number, as represented in our illustration above.

The distance through which speech can be carried on by means of speaking tubes is about 400 yards.

In fitting up the tubes it is of importance as far as possible to avoid bends, and to have a smooth inner surface and air-tight joints. For short distances compo or zinc tubing, $\frac{5}{8}$-inch or $\frac{3}{4}$-inch in diameter is used, but for long distances, or where there are many bends, gutta-percha, or 1 inch to $1\frac{1}{2}$ inch zinc or copper tubing should be used.

Guttapercha has the greatest carrying power, but not being a lasting material its use is recommended only in special cases. The mouthpieces at each end can be fitted with whistles, or where a number are in a row indicator pins can be added.

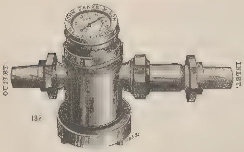


Fig. 334.

Water Meters.

The Water Meters made and supplied by us are made on Siemen's Turbine principle, which have stood the test of the Melbourne Water Supply since 1857, and in England for many years before that time.

We make our Meters of best gun-metal, from ½ inch to 1½ inch, and with improvements in some details make them the best Meters in the market, being made of gun-metal, rust does not accumulate in the interior.

Our Meters are all of the full standard size in every part and interchangeable, special tools have been made for this work. They are tested with water at high and low pressure. Every care is taken to give a superior article.

The large Meters, 2 inches to 8 inches, are made in cast iron, with a separate dirt box, and connected with flanges.

It has been found in practice that the larger Meters being a fixed length between the flanges, it was nearly impossible to remove them for cleaning; and in replacing, if the joints were not the same size, the flanges were often broken. To rectify this we make all our Meters above 2 inches with an expansion joint, so that no unequal strain comes upon the joints when being fixed, and it allows the Meter to adapt itself to its connections.

Directions and Instructions for Fixing.

Connect the supply pipe to the union joint of the filter end of the meter, marked "inlet," and the consumer's or service pipe to the union joint of the other end of the meter, marked "outlet." Let the meter be fixed perfectly level, and in such a manner and situation that it can be easily taken out for the purpose of repairs, and so that the dial can be easily read when fixed (dial or meter covers are sold for keeping the dial clean). When practicable, the meter should be fixed where it will be readily governed by a loose valve stop cock, or sluice valve.

Quantities of Delivery of Meters.

The power of delivery of the Meter will very materially depend upon the effective pressure of the waterworks, and the length of service pipe from the main to the meter, and from the meter to the place of delivery. The service pipe is usually put on the same size as the meter.

	Gals. per Hour.
⅜ in. Meter delivers from	300 to 500
½ " "	600 to 1,000
¾ " "	1,500 to 2,500
1 " "	2,200 to 3,800
1¼ " "	3,000 to 5,000
1½ " "	4,000 to 7,000
2 " "	8,300 to 14,000
3 " "	13,400 to 23 000
4 " "	18,500 to 32,000
5 " "	27,000 to 46,000
6 " "	45,000 to 77,000
8 " "	

N.B.—We should be glad if the foregoing quantities were referred to when the size of meter is being selected.

METER DIALS

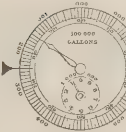


FIGURE 1

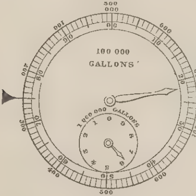


FIGURE 2

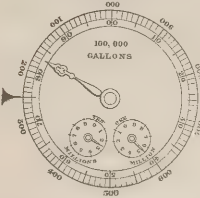


FIGURE 3

Description of, and Instructions for taking the Dials.

There are three ordinary size dials, Figs. 1, 2, and 3, *all of which revolve* and indicate 1,000 gallons each revolution; they are all essentially the same, but counting up to a higher number. Figs. 1 and 2 have two large outside circles and one small inner circle of figures; the outer one, referred to by the fixed pointer, represents 1,000 gallons each revolution, divided into 100 equal parts of 10 gallons, and is only used for experimental purposes, and for the more ready observation whether the meter is working, and is not taken into account when taking the meter; the large inner circle, referred to by the moveable hand, represents 100,000 gallons each revolution, divided into 100 equal parts of 1,000 gallons each. The small inner circle in both Figs. 1 and 2 represents 1,000,000 gallons each revolution, divided into 10 parts of 100,000 gallons each. Fig. 3, in addition to Figs. 1 and 2, has a second small separate circle with moveable hand, representing 10,000,000 gallons each revolution, divided into 10 equal parts of 1,000,000 gallons.

In taking the meters, observe which dial it is, whether it has one or two small separate circles of figures, and put down the figures referred to by its hand, beginning with the circle of the greatest value, in the respective columns, headed "Value of each revolution in gallons, 100 thousand, one million, ten millions."

In Fig. 1, the hand of the small circle has not arrived at one, so that the large inner circle of figures only is taken, and represents 100,000 gallons, divided into 100 divisions of 1,000 gallons. In this Fig. the hand is pointing to 85, which put in the column headed "100 thousand," will read "85 thousand gallons."

Fig 2 is similar to Fig. 1, but is a larger dial The circle of greatest value is the small separate one, and represents as in Fig. 1, 1,000 000 gallons The figure the hand has last passed is 6, which put in the column headed "one million." The next circle in value is the large inner one of 100 thousand, and the division or figure the hand is pointing to is 22, which put in the column headed "100 thousand," will read "622 thousand gallons."

Fig. 3 has three circles of figures—two small separate ones and one large inner circle. The circle of the greatest value is the small separate circle marked "ten million gallons;" the figure the hand has last passed is 2, which put in the column headed "ten millions." The next circle in value is the second small separate circle marked "one million gallons;" the figure the hand has last passed is 5, which put in the column headed "one million." The next is the large inner circle, value 100 thousand gallons, and the division or figure the hand is pointing to is 83, which put in the column headed "100 thousand," will read "2,583 thousand gallons."

Water Meter and Sluice Valve.

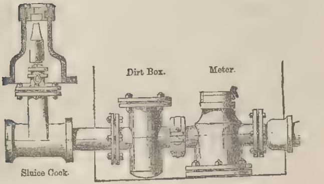


Fig. 335.

The above plainly shows our Water Meter and Sluice Valve, with connection fitted, for attaching to water mains for the supply of water to warehouses and factories, for lifts, manufacturing purposes, or as an auxiliary to the already existing pipes in the event of fire.

Triplet Water-Meter Apparatus.

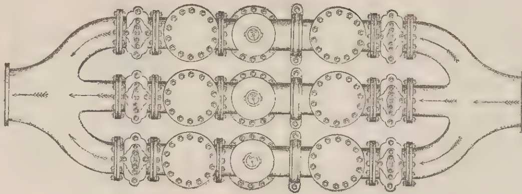


Fig. 336.

The above represents our Triplet Meter connection. The advantage of this system is obvious, for the simple reason it enables any one meter to be removed for examination or repair without stopping supply, which would, if only for a short time, very often prove a great annoyance as well as a serious loss. It is, therefore, preferable for use in Government works and large consumers of water. The adoption of small meters on this principle is now becoming very general, and has on several occasions proved, beyond doubt, to be a far safer method for ensuring a continuous supply, than with the single meter.

Sluice Valves, Flange, and Faucet.

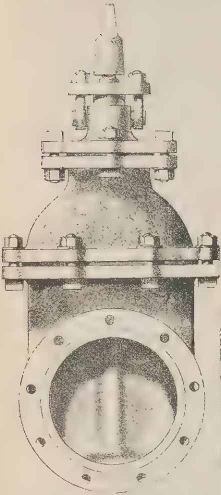


Fig. 337.

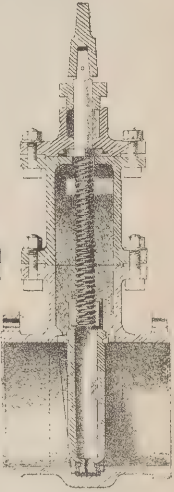


Fig. 338.

We make these Sluice Valves in sizes from 2½-inch to 30-inch, either flanged or faucet, as shown in the accompanying cut. They are of cast iron with gunmetal spindle, and valve accurately fitted and true. All our valves are tested up to a

pressure of 200 lbs. to the square inch before leaving the works, according to the prescribed test of the Water Supply. We have, on several occasions, carried out extensive contracts for these valves for the various Governments and Water Trust Commissioners throughout the Colonies, each and all of whom have testified to their superiority over other valves in point of purity of metal, combined with excellent workmanship, used in their manufacture.

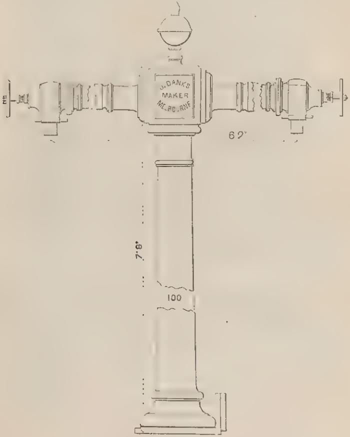


Fig. 339.

Street Stand Pipe.

These are in use in the suburbs and up-country cities and towns for filling water carts, and are greatly appreciated by water carriers and farmers.

FIRE BRIGADE & FIRE PREVENTING REQUISITES.

Fire Plug.

Fig. 340.

(As used by the Victorian Government).

We have made large numbers of these Fire Plugs for Victoria and other colonies, and are particularly careful that all materials used are the best to be got

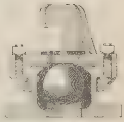


Fig 340

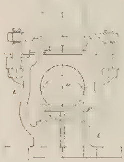


Fig 341.

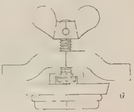


Fig. 342.

Patent Fire Plugs.

Our Patent Fire Plug, Fig. 341, has been designed with a view of keeping sewage or other offensive matter from entering the mains. The action will easily be understood on reference to the above diagram. The valve F closes directly the outflow of water ceases, effectually fulfilling the purpose for which it is intended.

Fig. 342 shows our Patent Cover adapted to the old-fashioned fire plug. The india-rubber ring G makes a perfect joint, and prevents any inflow.

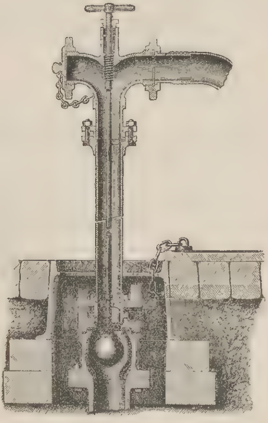


Fig. 343.

Fire Brigade Hydrant.

This may be had either with T handle, as shown, or with our double-purchase lever handle. Our Hydrants have long held first place, and the number we have manufactured is incredible. Our aim has been to make a light, strong, and serviceable article and the success which has attended our efforts may easily be seen by the astonishing demand.

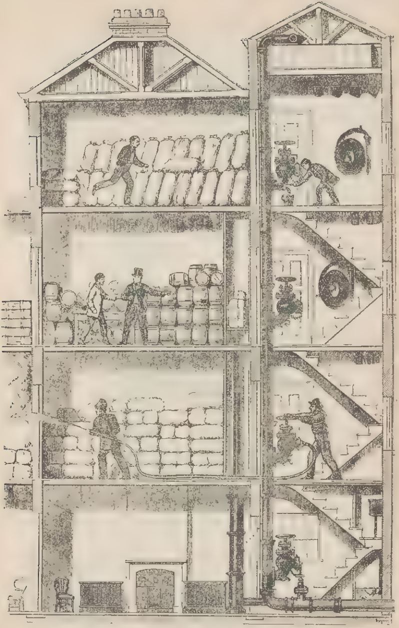


Fig. 344.

FIRE SERVICES.

Fig. 344 illustrates one of our plans for fitting up Fire Services through a warehouse. A valve on each floor, with the hose hanging handy, and a supply of water from tanks in the top part of the building to supplement the ordinary supply of water, completes a Fire Preventive Service, which may at any time save its owner many thousands of pounds. A ball-cock is used on the supply-pipe of the tanks, to insure their always being full. Where it is possible we advise that the water service be carried up the outside of the building, with hose-cocks close to the windows, and that iron steps, perpendicular if necessary, be connected with a platform properly railed in. A hose may be connected with any of the cocks, and the fire fought without danger of suffocation, and more effectual work done than could be accomplished if the services were inside the building.

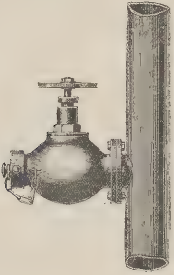
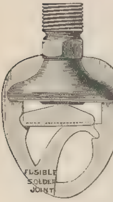


Fig. 345.

Straight Fire Cock.

This Cock is used in buildings such as the foregoing. We also make them in many different patterns, such as with bib nose and with outlet directly under seat of valve; in fact, as there is usually a sufficient number required for a building of ordinary dimensions, we are well pleased to alter our patterns to suit the particular requirements of our clients.



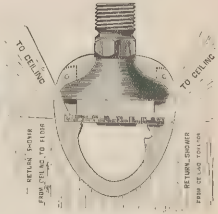


Fig. 346. Fig. 347.

Fire Extinguishers.

These very simple and handy contrivances are now so well-known as to need little explanation. Fig. 346 represents the Sprinkler at rest, and Fig. 347 shows it in operation.

The action is exceedingly simple, and easily understood. A small lever, which keeps the sprinkler closed, is held in position by a solder which melts at a very low temperature. It will be seen that directly the temperature rises to an abnormal degree that this lever will be released, causing a shower of water to descend as shown in Fig. 347. We recommend that these sprinklers be placed at intervals of ten feet in pipes running parallel lines ten feet apart. The utility of this Fire Extinguisher cannot be questioned; and as each sprinkler acts independently the water damage is confined to the area covered by the Extinguishers opened.

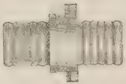


Fig. 348.

Hose Union.

Our Hose Unions are made of gunmetal, and are specially strengthened in any parts likely to be injured by rough usage. We make them either five or three thread to the inch, and, if necessary, very light for competition purposes.

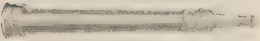


Fig. 349.

Fig. 350. Fig. 351.

Fire Brigade Directors.

These Directors are made of copper tube, and are mounted with gunmetal They are strong, light, and serviceable.

Fig. 352.

Small Director, with Tap.

Fig. 352 represents a small Director with a tap, which is useful in case of small outbreaks, or in cases where valuable goods might otherwise be damaged by carrying a running hose through a building to the seat of a fire.

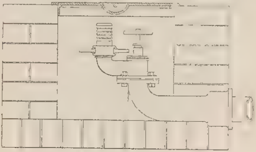


Fig. 353.

Mill Cock.

METHOD OF FIXING SCREW-DOWN HYDRANT, OR MILL COCK.—We have supplied hundreds of these Mill Cocks to the Government—in fact it is almost the only pattern in use throughout the Government workshops and stores. As will be seen by the above sketch, it is well adapted for yards and such places where anything projecting above the surface of the ground would most likely be damaged in many ways.

Bells.

Fig. 354.

We have long made a speciality of the manufacture of Bells, and our manufactures in this respect have always brought us much credit. Our bells are now rung throughout the Australian colonies, and in some of the South Sea Islands. The following testimonial from one of the greatest musicians of the age is, we think, sufficient evidence of the quality of our specially tuned bells :—

"Centennial International Exhibition, Melbourne, 1888.

"Exhibition Buildings,
Melbourne, 12th Dec , 1888.

"Gentlemen,—I have the honour, by direction of the Executive Commissioners, to convey to you their thanks for your kindness in casting a set of Bells specially for the performance of Sullivan's 'Golden Legend.'

"Mr. Cowan also wishes to express his thankfulness for your timely assistance, and states that the tone of the bells was eminently satisfactory.

"I have the honour to be, Gentlemen,

"Your obedient Servant,

"G. MILLER,
"Music Business Manager.

"Messrs. John Danks & Son,
"42 Bourke Street West, City."

The greater number of the gongs used by the Tramway Company, Melbourne, were supplied by us, and have given every satisfaction.

Our Bells are hung, if required, with our patent jointed clappers and triggers, which do away altogether with the necessity of swinging the bell, and allow of the rope being conducted where thought proper.

In this arrangement the clappers cannot lie against the bell and cause a jar. The sizes are as follow :—

WEIGHT AND SIZE OF BELLS.

(APPROXIMATE.)

Diameter	Lbs.	Ozs.	Diameter.	Qrs.	Lbs.	Ozs.	Diameter.	Cwts.	Qrs.	Lbs.	Ozs.
2⅜		5	6⅝		5	2	15		3	0	0
2⅝		6	7		6	8	16		3	10	0
3		7	7½		10	2	17	1	0	14	0
3⅛		8	7¾		13	2	18	1	1	0	0
3¼		10	8¾		15	12	19	1	2	0	0
3⅝		12	9		20	0	20	1	3	0	0
4¼	1	2	9½		22	8	21	2	0	0	0
4½	1	7	10½		29	0	22	2	1	7	0
4¾	1	13	11	1	5	0	23	2	2	11	0
5	2	6	12	1	12	0	24	3	0	0	0
5½	3	2	13	2	0	0	30	5	3	1	0
6¼	4	4	14	2	10	0	36	8	2	0	0

Fig. 355.

Fig. 355 shows our handy Fire Pump with tank for use in factories, high buildings, hospitals, theatres, and the like buildings. We have supplied a great many of these to the Government, and to charitable institutions. It is a very effective pump, and is almost indispensable, as it is quite capable of quenching a small outbreak that might otherwise result in a terribly disastrous fire.

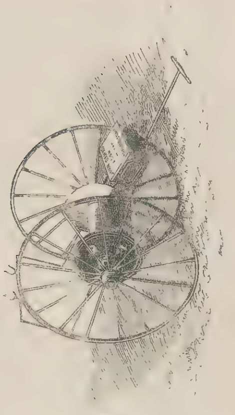


Fig. 356.

Fire Hose Reel.

The above is a rough drawing of our Hose Reel as supplied to the Victorian Government, many of our Fire Brigades and large Mercantile Stores. We make a speciality of Hose Reels, and the beautiful specimens of workmanship shown at the Exhibition and at the Agricultural Show called forth the highest praise.

Fig. 357.
Manual Fire Engine.

The foregoing illustration represents our Manual Fire Engine. We have for a number of years made a speciality of Fire Engines, and the testimonials following will show that our efforts have met with the greatest success.

Every detail is faithfully worked out, and we claim as the result that our Engine is the quickest and the most powerful in the market. We usually keep at least one engine in stock, so that our clients are not kept waiting unnecessarily.

Fire Engines.

Gentlemen,—I have much pleasure in certifying to the superior excellence of your Fire Engine. I have had about twelve years' experience in Fire Brigades, and I must say that I find your Engine far and away the best one in every respect that I have ever handled.—Yours truly,

H. CARLYON, Captain Soldiers' Hill V.F.B.

Gentlemen,—I beg to congratulate you on the success which has attended your efforts in turning out of your establishment a Fire Engine with such good results, it having taken the two first prizes at Ballarat against other engines. Its merits and workings are all that can be desired.—Yours respectfully,

E. HORBURY, Captain Sale F.B.

Gentlemen, My opinion is that your Engine was one of the best (if not superior to any) on the ground, and is worthy of the highest recommendation.—

Yours respectfully,

NATHANIEL McGRATH, Captain Buninyong F.B.

Gentlemen, -My opinion is that there is not a faster Engine in the colony.—

Yours truly,

PETER R. RITCHIE, Captain Corowa V.F.B.

Gentlemen,—The Engine built by you is both quick at suction and delivery, and as regards strength, she is very powerful. We used her at Ballarat, and were very much pleased with her work. -Yours respectfully

(On behalf of Captain J. Israel),

J. H. MARSH, Hon. Sec. Standard Brewery F.B.

Our Brigade used this Engine at Ballarat. I consider it a first-class Engine in every respect. It reflects great credit on your establishment. Yours respectfully,

A. McLEAN, Captain Beechworth V.F.B.

I consider the Benalla engine an excellent one. It was used by all Brigades in the late Demonstration in the fours event, and it stood this severe strain in a most satisfactory manner, clearly showing that the workmanship is of the best description. The Engine takes water very quickly. -Yours truly,

JOHN LYNCH, Jun., Captain Smythesdale V.F.B.

I am directed by the Ballarat Fire Brigade to state that the Engine made by you and used at the late Demonstration, worked well, drew the water quickly, and gave general satisfaction. The workmanship of the Engine is very good, and reflects great credit on your firm.—Yours respectfully,

WM. T. BURROWS, Secretary.

Gentlemen,—Conscientiously I do not think that any person, however prejudiced, could give a bad opinion of it. There are several valuable improvements in its construction, which in my estimation are far before the imported Engines. For quick water and easy working it was by far the best Engine on the ground.—Yours, etc., JOHN MARK, Captain Lintons V.F.B.

Gentlemen,—The Brigade are of opinion that your Engine was of a very superior make, and worked splendidly and quickly. "Advance Australia" - Yours respectfully, JOHN W. TERRY, Hon. Sec. Inglewood V F B

"BENDIGO INDEPENDENT."

The perfection of the colonial-made engine was fully apparent. The Engine, which is the production of Messrs Danks & Son, did its work remarkably well, and stood all demands made upon it.

"BALLARAT STAR."

. . The Benalla Brigade then offered to lend their Engine, a colonial-made one, manufactured by Danks & Son, of Melbourne. This Engine proved a much superior one to the others, and was probably the best one on the ground In fact, the water came so quickly that teams not particularly smart were overtaken at coupling of branch, and missed.

"BALLARAT COURIER."

Another Engine was got, but this failed at the first trial. The third was a colonial-made Engine, manufactured by Danks & Son, of Melbourne, and it proved not only equal to the tests, but in the eights the teams who used it made much better time than those who did not.

Danks' Patent Universal Joint Street-Watering Hydrant.

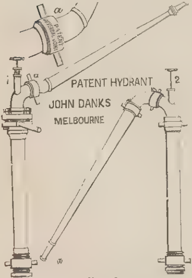


Fig. 358

The foregoing sketch shows our Patent Universal Joint Street-Watering Hydrant, which is now used in all of our leading cities and towns. It is lightly constructed, and with fewer joints than any other hydrant for the purpose.

GAS WORKS REQUISITES.

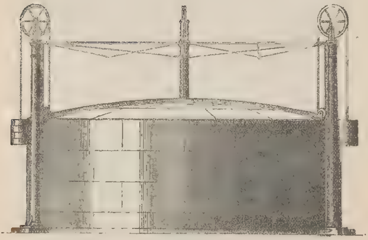


Fig. 359.

We manufacture and import all Requisites for Gas Works. Our cast iron pipe foundry has been very successful, and we have turned out several large lines to the order of many of our city, shire and town councils, and gas companies. We are always pleased to give information as to the cost of gas works for towns of any size, and to undertake the supply and erection of the complete plant. Fig. 359 shows our small gas holders suitable for small up country towns. We manufacture these in all sizes, and to engineers' designs.

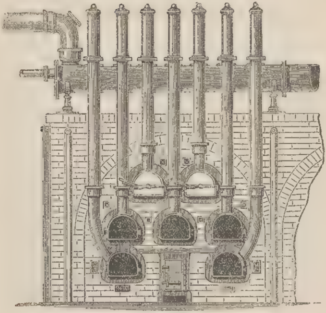


Fig. 360.

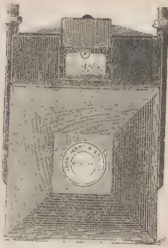
Retorts and Connections.

We usually keep a stock of Retorts on hand, and are continually making the connections to design, etc., and orders for this department always receive our special attention.

Fig. 361.

Gas Meters.

We have always a large stock of wet and dry gas meters on hand, and can supply large orders on short notice.



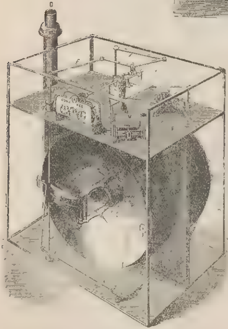


Fig. 362.

Dry Gas Meter in Glass Case.

This form of meter serves to demonstrate the action of the Dry Meter, and is very useful to gas engineers.

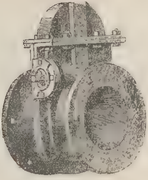


Fig. 363.

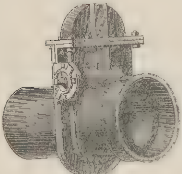


Fig. 364.

Gas Valves, Flanged and Faucet.

We make these in all sizes, and in several forms, those most favoured being a type of valve as shown in Figs. 337 and 338, and as shown in above Figs.

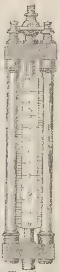


Fig. 365.

Gas Guages.

These are made in several sizes, the smallest being suitable to carry in the pocket.

The following Table will no doubt prove handy to architects, builders, and plumbers

NUMBER OF CUBIC FEET OF GAS DISCHARGED PER HOUR BY PIPES OF VARIOUS SIZES AND LENGTHS AT A PRESSURE OF $\frac{4}{10}$.

Length from the Supply Pipe.	Internal Diameter.										
	$\frac{5}{16}$ In.	$\frac{3}{8}$ In.	$\frac{7}{16}$ In.	$\frac{1}{2}$ In	$\frac{5}{8}$ In.	$\frac{3}{4}$ In.	1 In.	$1\frac{1}{4}$ In.	$1\frac{1}{2}$ In.	$1\frac{3}{4}$ In.	2 In.
10 feet ...	40	63	93	130	228	360	738	1291	2037	2995	4185
20 ,, ...	28	45	66	92	161	254	522	913	1440	2118	2952
30 ,, ...	23	37	54	75	131	208	426	745	1176	1729	2415
40 ,, ...	20	32	46	68	114	180	369	645	1018	1497	2090
50 ,, ...	18	28	41	58	102	160	330	577	911	1339	1871
60 ,, ...	16	26	38	53	93	147	302	527	832	1223	1707
70 ,, ...	15	24	35	49	86	136	279	488	768	1132	1583
80 ,, ...	14	22	33	46	80	127	261	456	720	1059	1478
90 ,, ...	13	21	31	43	76	120	246	430	679	998	1396
100 ,, ...	12	20	29	41	72	114	233	408	644	947	1322
125 ,, ...	11	18	26	37	64	101	209	365	576	847	1184
150	10	16	21	33	58	93	190	334	528	773	1080
175 ,, ...	9	15	22	31	54	86	176	308	487	716	1000
200 ,, ...	9	14	20	29	51	80	165	288	455	669	935
225 ,, ...	...	13	19	27	48	76	156	274	430	630	880
250 ,, ...	...	12	18	26	46	72	147	258	407	599	836
300 ,, ...	...	...	17	24	41	65	137	236	376	547	764

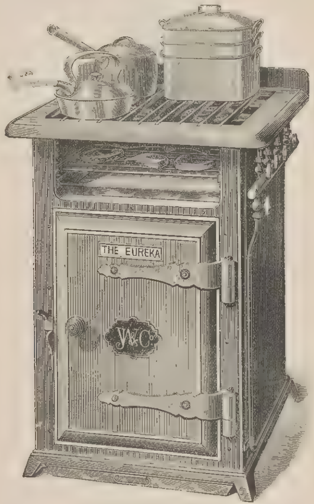


Fig 366.

Gas Cooking Stoves.

A large assortment by all makers always in stock.

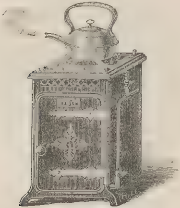


Fig. 367.

Small Gas Cooker.

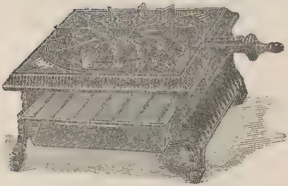


Fig. 368.

Bachelor's Gas Cooker.

Will cook chops or steak, and boil at the same time.

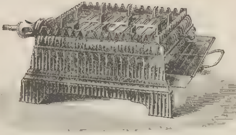


Fig. 369.

The Bachelor's Gas Cooker.

Will cook chops or steak, and boil at the same time.

Fig. 370.

Bachelor's Gas Cooker.

Will cook chops or steak, and boil at the same time.

Fig. 371.

Boiling Plate.

A very useful adjunct to the Gas Cooker in large families and restaurants.

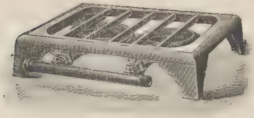


Fig. 372.

Double Gas Boiling Stove.

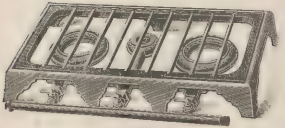


Fig. 373.

Treble Gas Boiling Stove.

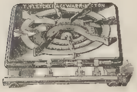


Fig. 374.

Treble-ring Gas Boiler.

May be used with either one, two, or three rings burning.

Fig. 375.

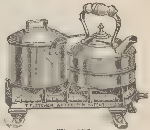


Fig. 376.

Double Boiling Stove.

A cheap and handy arrangement.

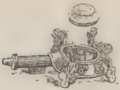


Fig. 377.

The "Shamrock" Single Gas Boiling Stove.

This is a very effective Stove. As may be seen from the sketch, the burner is made so that it can easily be detached and washed thoroughly.

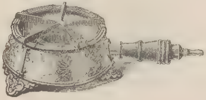


Fig. 378.

Gas Boiling Stove.

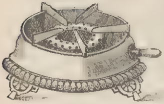


Fig. 379

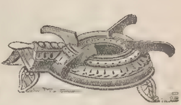


Fig. 380.

Gas Boiling Stoves.

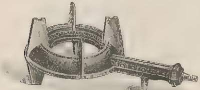


Fig. 381.

Gas Boiling Stove.

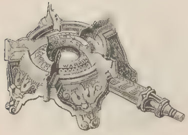


Fig. 382.

Gas Boiling Stove.

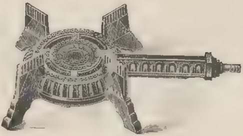


Fig. 383.

Gas Boiling Stove.

With Three Rows of Flame Holes.

Fig. 384.

Gas Boiling Stove.

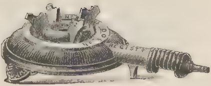


Fig. 385.

Gas Boiling Stove.

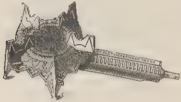


Fig. 386.

Solid Flame.

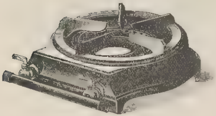


Fig. 387.

With Two Taps.

Fig. 388.

High-Power Bunsen Burner.

Suitable for Large Urns and Hot Plates.

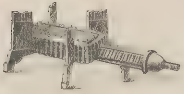


Fig. 389.
Suitable for Heating Sad Irons.

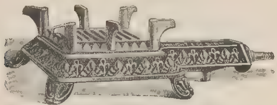


Fig. 390.
Suitable for Heating Sad Irons.

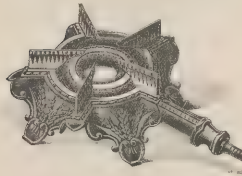


Fig. 391

Fig. 392

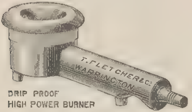


Fig. 393.

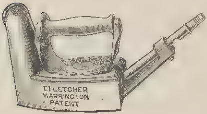


Fig 394.

Gas Smoothing Iron.

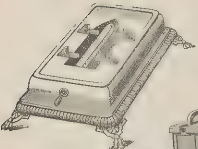


Fig. 395.

Tailor's Iron Stove.

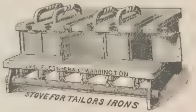


Fig. 396.

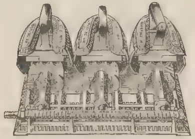


Fig. 397.

Stove for Flat Irons.

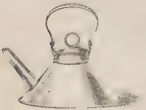


Fig. 398.

Fast Boiling Kettle.
In Copper and Tin.
7, 8, 9 10 inch.

Fig. 399.

Kettles.
In Copper and Tin.
7, 8, 9, 10 inch.

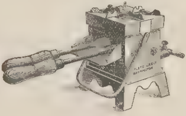


Fig. 400.

Gas Soldering-Iron Heater.

Fig. 101

Elegant Gas Fire.

391 Bourke St., Melbourne; 363 Pitt St., Sydney.

GAS HEATING STOVES.

Fig. 402.

May be had either with or without Side Pieces.

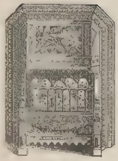


Fig. 403

Fig. 404

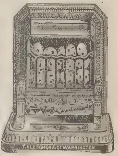


Fig. 405.

Gas Fires.

Fig. 406.

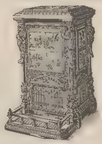


Fig. 407.

Gas Fires.

Fig. 408.
Gas Fire.

Fig. 409.
Gas Fire.

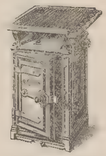


Fig. 410.
Gas Cooker.

Fig. 411.

Gas Fire.

Fig. 412.

Bunsen Burner.

Very powerful.

Fig. 413.

Student's Bunsen Burner.

With Regulator for admission of air.

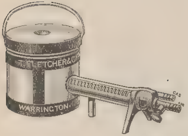


Fig. 414.

Gas Furnace.

With Bunsen.

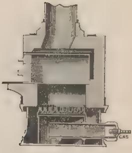


Fig. 415.

Gas Furnace.

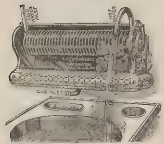


Fig. 416

Small Water Heater

For Bason.

This is a handy little arrangement, and is well adapted for the purpose for which it is made.

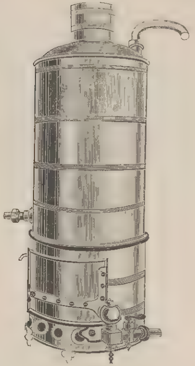


Fig. 417.

Danks' Patent Bath Water Heater.

This Heater, which is made of copper, is so constructed that the water does not come in contact with the fumes of the burnt gas and the heat is so baffled that the escaping fumes are never more than three or four degrees hotter than the water which has passed through the heater. The lighting arrangements do away with all fear of explosion, as the whole of the jets are swung clear of the heater when the door is opened, and are lit while in this position.

It is imperative, with this and all other heaters in which atmospheric burners are used, that the chimney should conduct the fumes either through the roof or into the space between the roof and the ceiling in order that the fumes may escape. This heater has already found great favour with our clients, so much so that we have scarcely found ourselves able to supply all the orders we have received. It is sightly, takes up very little room, and may be so connected as to supply hot water through the shower as well as into the bath.

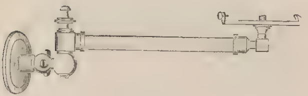


Fig. 418.

Cheap Single Bracket.

Sizes, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ inch.

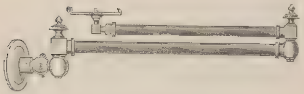


Fig 419.

Cheap Double Bracket.

Sizes, $\frac{1}{2}$ x $\frac{3}{8}$, $\frac{5}{8}$ x $\frac{1}{2}$, $\frac{3}{4}$ x $\frac{5}{8}$ inch.

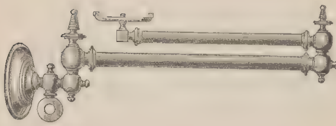


Fig. 420.

Strong Double Bracket.

Sizes, $\frac{5}{8}$ x $\frac{1}{2}$, $\frac{3}{4}$ x $\frac{5}{8}$ inch.

Fig. 421.

Strong Single Fancy Bracket.
Sizes, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$ inch.

Fig. 422.

Cheap Double Fancy Bracket.
Sizes, $\frac{1}{2}$ x $\frac{3}{8}$, $\frac{5}{8}$ x $\frac{1}{2}$, $\frac{3}{4}$ x $\frac{5}{8}$ inch.

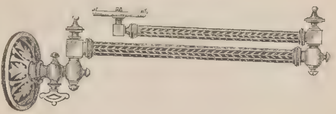


Fig. 423.

Strong Double Fancy Bracket.
Sizes, $\frac{5}{8}$ x $\frac{1}{2}$, $\frac{3}{4}$ x $\frac{5}{8}$, 1 x $\frac{3}{4}$, $1\frac{1}{4}$ x 1, $1\frac{1}{2}$ x $1\frac{1}{4}$ inch.

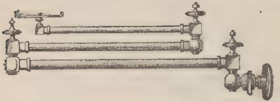


Fig. 424.

Treble Bracket.

Sizes, $\frac{3}{4} \times \frac{5}{8} \times \frac{1}{2}$; $1 \times \frac{3}{4} \times \frac{5}{8}$

These Brackets are made double, that is, two treble brackets fixed to one back, if required.

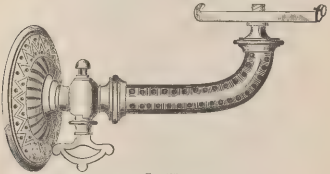


Fig. 425.

Stiff Fancy Reeded Bracket.

Sizes, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ inch.

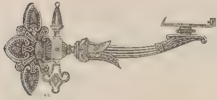


Fig. 426.

Fancy Cast Stiff Bracket.

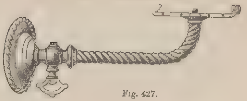


Fig. 427.

Stiff Fancy Bracket,
$\frac{1}{2}$, $\frac{3}{8}$, $\frac{3}{4}$ inch.

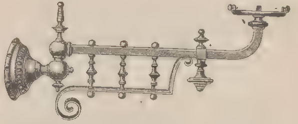


Fig. 428.

Fancy Bracket, Pillar Pattern.

Fig. 429.

Cheap Fancy Scroll Bracket.

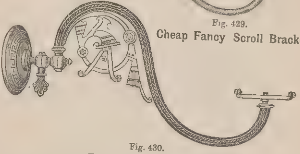


Fig. 430.

Fancy Scroll Bracket.

Fig. 431.

Mermaid Bracket.

Made in two sizes. A most effective bracket for landing, corridor, bathroom, and balcony.

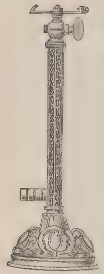


Fig. 432.
Pillar Light.

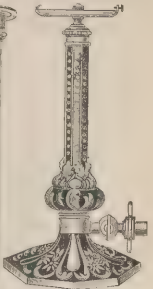


Fig. 433.
Pillar Light.

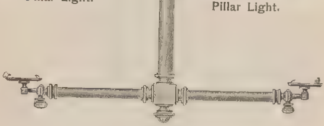


Fig. 434.

Stiff Pendant.

This is supplied with Ball Joint when required, and may be fitted up as a Combination Light for Electricity and Gas.

Hundreds of Combination Lights have been supplied for the large buildings in Melbourne.

Sizes, ⅝ x ½, ¾ x ⅝, 1 x ¾, 1¼ x 1, 1½ x 1¼, 2 x 1½ inch.

Made with Two, Three, Four, and Six Arms.

Fig. 436

Single Stuffing-box Slide.

Sizes, $\frac{5}{8}$, $\frac{3}{4}$ inch.

This Light may be had with two arms, and made of fancy tube.

Fig. 435.

One light Water Slide.

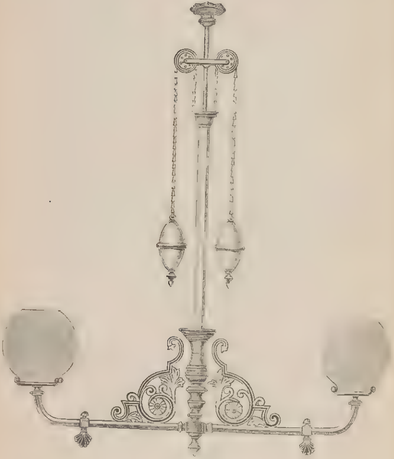


Fig. 457.

Two-light Water Slide.

May be had in three, four, and five lights.

Fig. 438.

Two-light Water Slide.

May be had in three, four, and five lights.

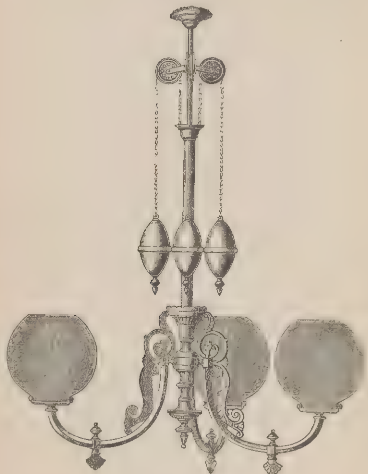


Fig. 439.

Three-light Water Slide.

May be had in two, four, and five lights.

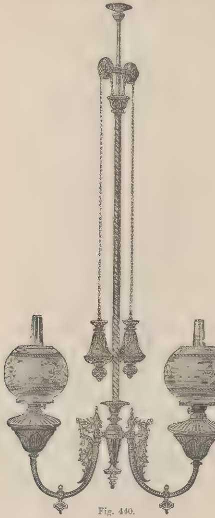


Fig. 440.

Three-light Water Slide,

Fitted for Kerosene.

May be had in three, four, and five lights.

Fig. 441.

Three-light Water Slide.

May be had in two, four, and five lights.

Fig. 442.

Three light Water Slide.

It would be impossible to show all the different designs of Chandeliers in stock in a catalogue of this kind, and the designs shown are merely as a guide as to the class of fitting our clients at a distance may require.

Fig. 443.

Three-light Water Slide.

Fig. 444.

Three-Light Water Slide.

It would be impossible to show all the different designs of Chandeliers in stock in a catalogue of this kind, and the designs shown are merely as a guide as to the class of fitting our clients at a distance may require.

Fig. 445.

Three-light Water Slide.

Fig. 446. Three-light Water Slide.

It would be impossible to show all the different designs of Chandeliers in stock in a catalogue of this kind, and the designs shown are merely as a guide as to the class of fitting our clients at a distance may require.

Fig. 447.

Three-light Water Slide.

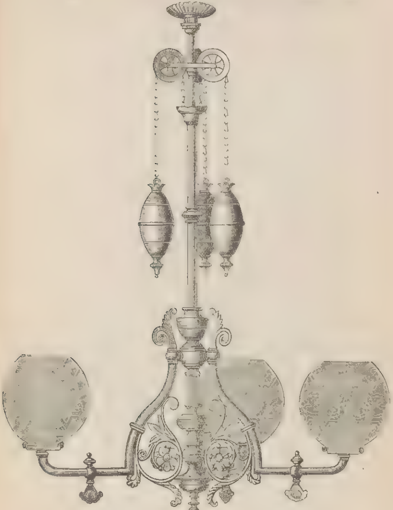


Fig. 448. **Three-light Water Slide.**

It would be impossible to show all the different designs of Chandeliers in stock in a catalogue of this kind, and the designs shown are merely as a guide as to the class of fitting our clients at a distance may require.

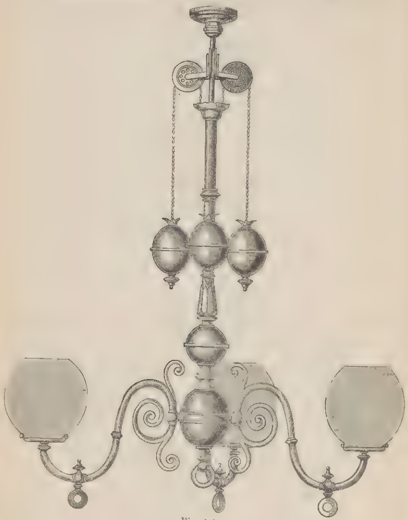


Fig. 449.

Three-light Water Slide.

Fig. 450.

Four-light Water Slide.

It would be impossible to show all the different designs of Chandeliers in stock in a catalogue of this kind, and the designs shown are merely as a guide as to the class of fitting our clients at a distance may require.

Fig. 451.

Five-light Water Slide.

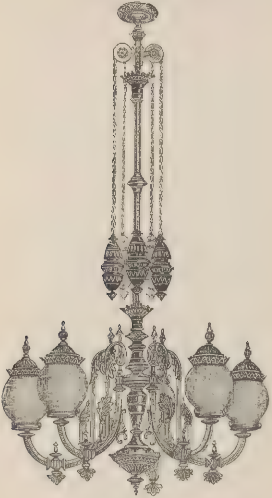


Fig. 452.

Five-light Water Slide.

It would be impossible to show all the different designs of Chandeliers in stock in a catalogue of this kind, and the designs shown are merely as a guide as to the class of fitting our clients at a distance may require.

Fig. 453.

Harp Hall Ligh

With Reeded Tube.

Fig. 454.

Three armed Hall Light.

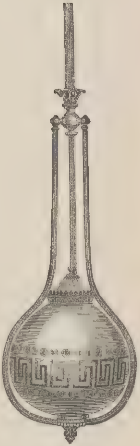


Fig. 455.

Three-armed Hall Light.

Fig. 456.

Three armed Hall Light.

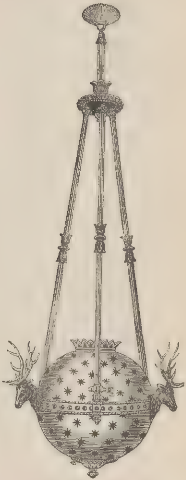
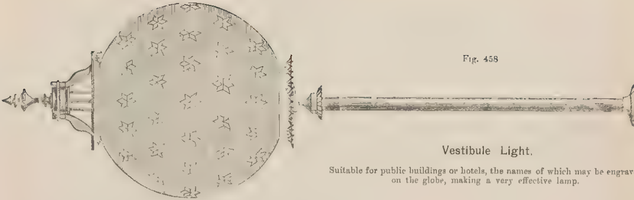


Fig. 457.

Stag's Head Hall Lamp.

Fig. 458



Vestibule Light.

Suitable for public buildings or hotels, the names of which may be engraved on the globe, making a very effective lamp.

Fig 459.
Cheap Leaded Hall Lamp.

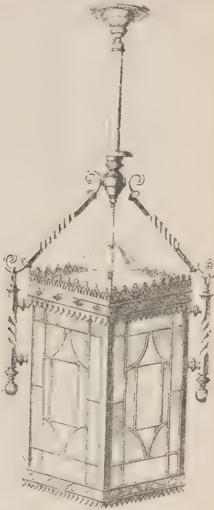


Fig. 460.
Leaded Hall Lamp.

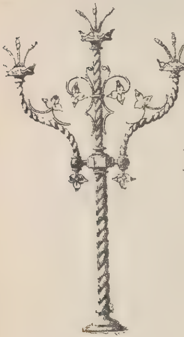


Fig. 461.
Church Light.

Fig. 462.
Church Bracket.

Fig. 463.
Church Bracket.

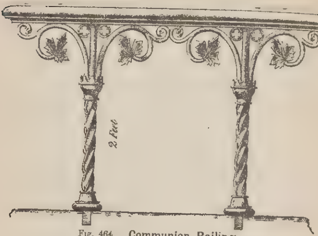


Fig. 464. Communion Railing.

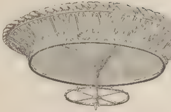


Fig. 465. Sunlight.

Fig. 466. Pulpit Light.

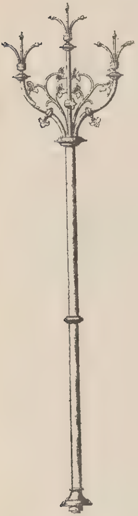


Fig. 467.

Chancel Light.

Fig. 468.

Chancel Light.

Fig. 469.

Fig. 470.

Chancel Lights.

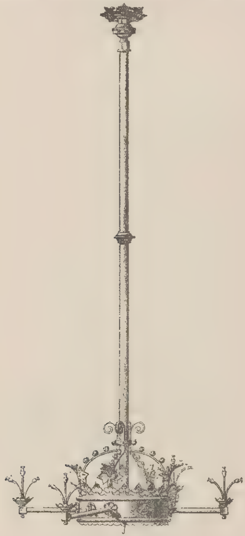


Fig. 471. Church Pendant.

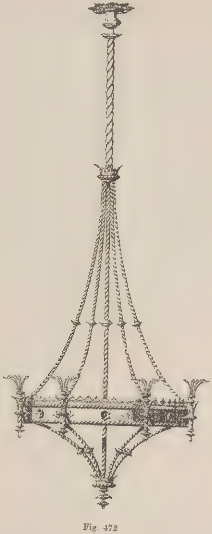


Fig. 472
Church Pendant.

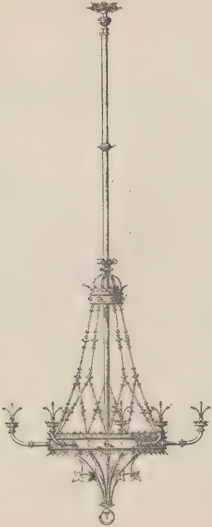


Fig. 473.
Church Pendant.

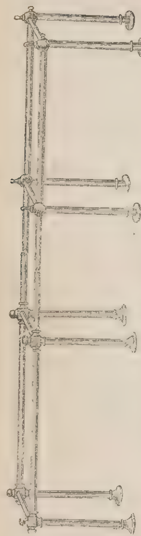


Fig 474. Desk Rails.

We make these in several designs, either fitted for gas as shown, Fig 475, or as shown above.

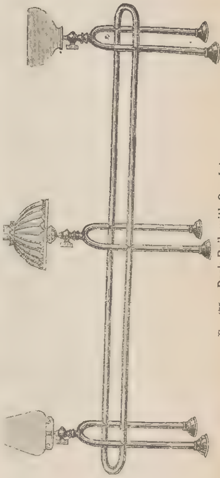
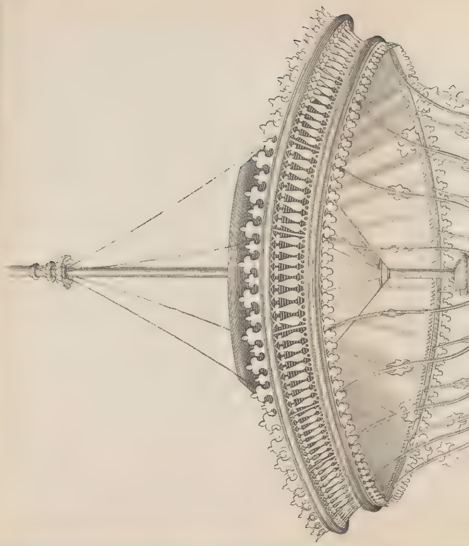
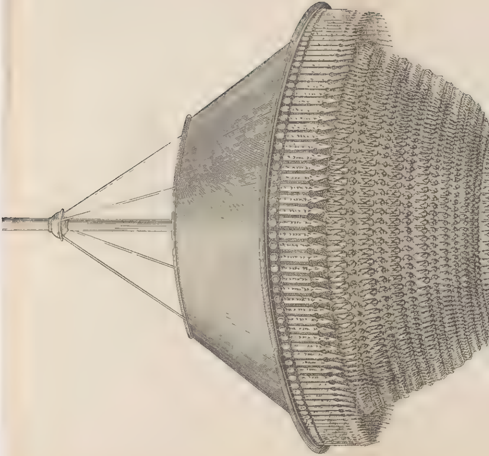


Fig. 475 Desk Rail, with Gas Jets.





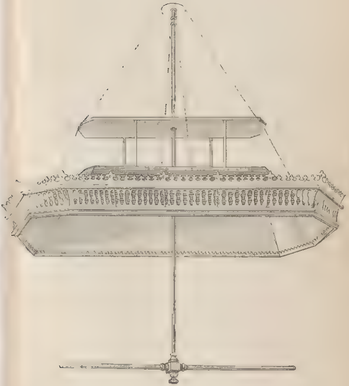
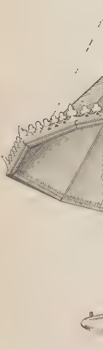


Fig. 479.

Sunlight.

Long, with bead, pillar pattern border and fringe



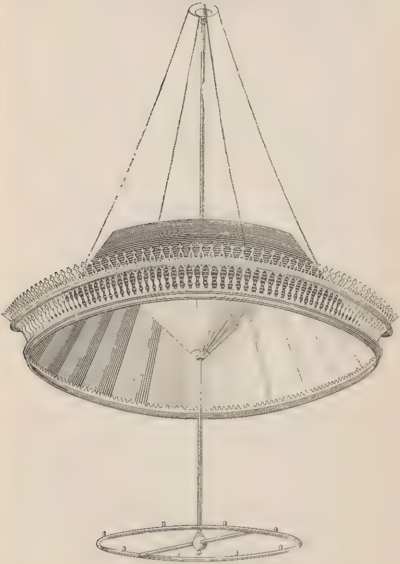


Fig. 481.
Sunlight,
With bead, pillar pattern border, and fringe.

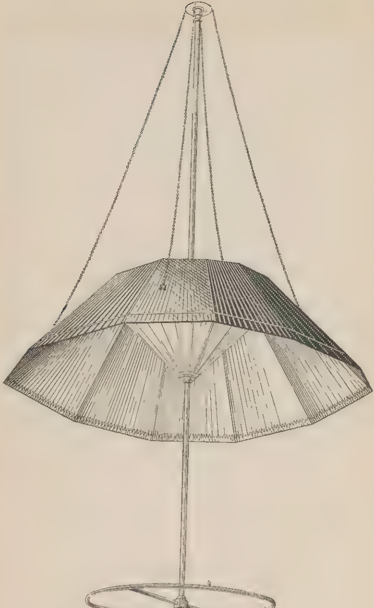


Fig. 182.
Plain Sunlight.

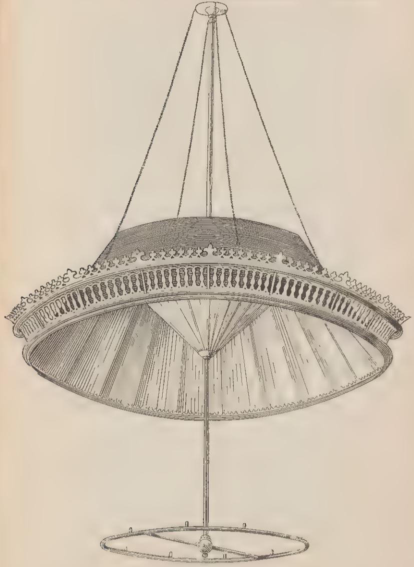


Fig. 483.

Sunlight.

With bead, pillar pattern border, and fringe.

Fig. 484.
Jeweller's Lamp.

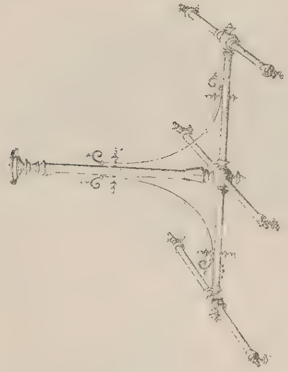


Fig. 485.
Billiard Light.
These are blocked in many different designs, and at all prices.

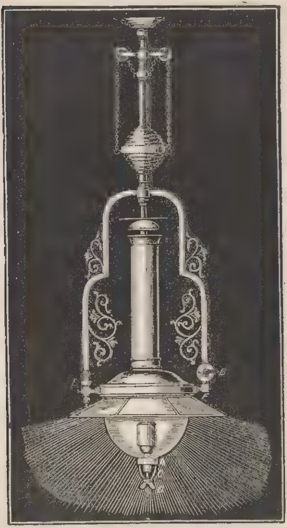
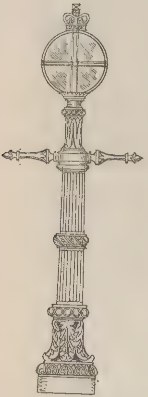
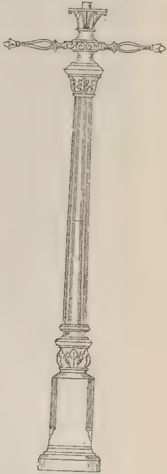


Fig. 486.
Regenerative Lamp.



B

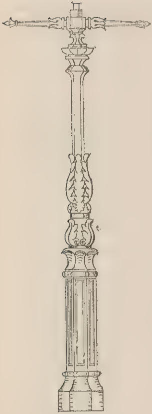
Fig. 487.



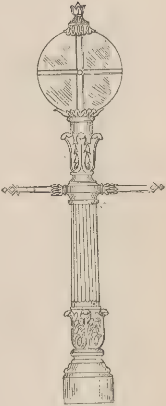
A

Fig. 488.

Gas Lamp Pillars.

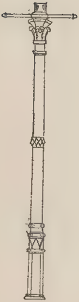


G
Extreme Length
Price
Fig. 489.



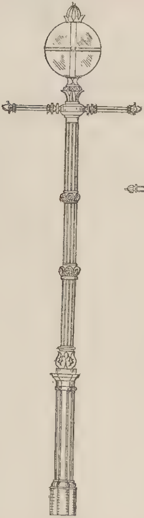
J
Extreme Length
Price
Fig. 490.

Gas Lamp Pillars.



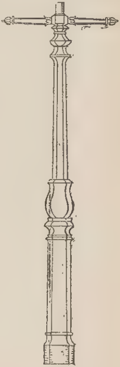
F

Fig. 491.



H
Extreme Length 14' 6"
Price

Fig. 492



E

Fig. 493.

Gas Lamp Pillars.

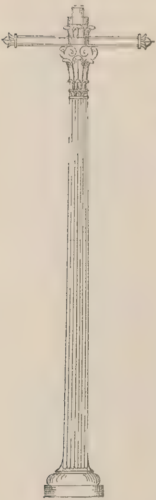


Fig. 494.

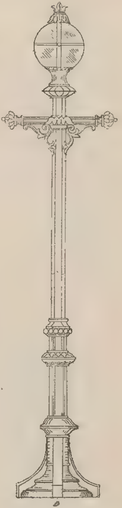


Fig. 495.

Gas Lamp Pillars.

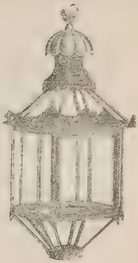


Fig. 496. Street Lamps. Fig. 497.

Fig. 498.

We make Lamps in many different designs, and are always pleased to advise our clients as to the particular design suitable for the purpose required.

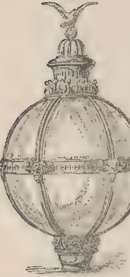


Fig 499.
We have made large numbers of Lamps of this design for Public Buildings, Hotels, and Halls.

Fig. 500.

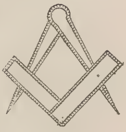


Fig 501.

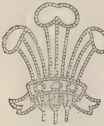


Fig. 502.

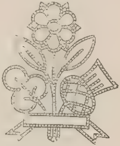


Fig. 503.

Gas Illumination.

We make a speciality of this line, and have always a large stock on hand.

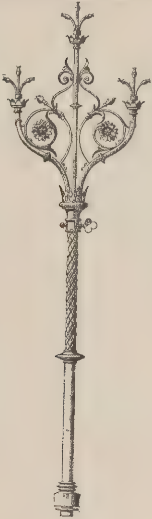


Fig. 504.

Chancel Light.

See other Chancel Lights and Church Fittings, pages 275 to 287.

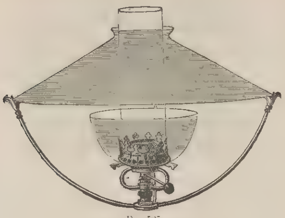


Fig. 505.

Regulating Argand Burner,

With Frame, Cup, Chimney, and Shade.

Fig 506.

Ellis Burner Gallery Globe, Corona and Calotte.

Fig. 507.

Corona and Calotte,

Suitable for Ellis, Comet, or Pine Globes.
A large and varied stock of Globes always on hand.

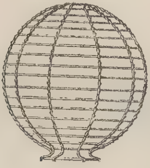


Fig. 508.

Wire Globes

For Theatres and Shops.

Economiser Burner.

The following illustration speaks for itself, and where gas is obtainable at good pressure this is very little exaggerated. Our Economiser Burner consists of a measuring arrangement, which only allows half of the usual amount of gas to enter the Burner, and thus reduces the pressure, allowing the gas to be burnt slowly, and ensuring perfect combustion.

The flame, instead of being stunted and almost wholly composed of blue, is a fine flat white flame, so that with half the usual amount of gas used by the Burner, a light is given equal to two. This Burner has been sold in thousands, and still holds its own.

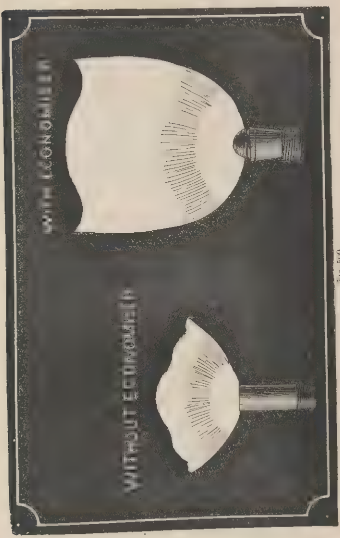
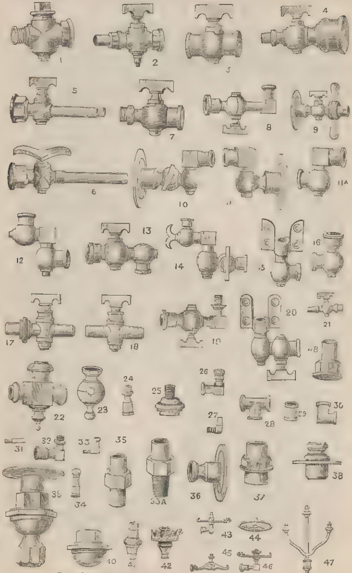


Fig 509.



Gas Cocks and Fittings —(see next page).

1. Main Cock—¼, ⅜, ½, ¾, 1, 1¼, 1½, 2, 2½, 3 inch for Iron pipe
2. Main Cock with Cap and Lining—¼, ⅜, ½, ¾, 1, 1¼, 1½, 2, 2½, 3 inch for Iron pipe
3. Pendant Cock—⅜, ½ x ⅜, ½, ⅝ x ½, ⅝, ¾ inch Brass.
4. Nose Cock—⅜, ½ x ⅜, ⅝ x ⅜, ¾ x ⅜, 1 x ⅜, 1¼ x ⅜, 1½ x ⅜ inch Brass.
5. Lamp Cock, T Handle—¼, ⅜, ½ inch for Iron pipe.
6. Lamp Cock, Double Lever Handle—¼, ⅜, ½ inch for Iron pipe.
7. M. F. Cock for Brass—⅜, ½, ⅝, ¾ inch Brass.
8. Elbow Cock—⅜, ½, ⅝, ¾ Brass; ⅛, ¼, ⅜, ½, ¾ inch for Iron pipe.
9. Hose Cock, with Back—⅜, ½ inch Brass.
10. Bracket Back—⅜, ½, ⅝, ¾, 1 Brass; ⅛, ¼, ⅜, ½, ¾ inch for Iron pipe.
11. Pendant Top—⅜, ½, ⅝, ¾, 1 Brass; ⅛, ¼, ⅜, ½, ¾ inch for Iron pipe.

11A. Double Swivel—⅜, ½ x ⅜, ½, ⅝ x ½, ⅝, ¾ x ⅝ Brass; ¼, ⅜ x ¼, ⅜, ½ x ⅜, ½ inch for Iron pipe.

12. Universal Swivel—⅜, ½ x ⅜, ½, ⅝ x ½, ⅝ inch Brass.
13. Single Swivel Cock—⅜, ½ x ⅜, ½ inch Brass.
14. Universal Swivel, with Cock—⅜ x ¼, ½ x ⅜ inch Brass.
15. Wing Back—⅜, ½, ⅝ Brass; ¼, ⅜, ½ inch Brass.
16. Single Swivel—⅜, ½ x ⅜, ½, ⅝ x ½, ⅝ inch Brass.
17. Compo. Cock and Union—¼, ⅜, ½, ⅝, ¾, 1 inch.
18. Compo. Cock—¼, ⅜, ½, ⅝, ¾, 1 inch.
19. Elbow Cock for Gallery—⅜, ½, ⅝, ¾ Brass; ⅛, ¼, ⅜, ½, ¾ inch for Iron pipe
20. Wing Back, with Cock—⅜, ½, ⅝, ¾ Brass; ⅛, ¼, ⅜, ½ inch for Iron pipe.
21. Cigar Cock—¼, ⅜ inch Brass.
22. Pendant Body—⅜, ½ x ⅜, ⅝ x ½, ¾ x ⅝, 1 x ¾, 1¼ x 1, 1½ x ¼ Brass; ½ x ⅜, ¾ x ½, 1 x ¾ inch for Iron pipe.
23. Pendant Body—⅜, ½ x ⅜, ⅝ x ⅜, ¾ x ½ inch.
24. Nose Piece—⅜, ½ x ⅜ inch Brass.
25. Nose Piece—⅜, ½, ⅝, ¾, 1, 1¼ inch Brass.
26. Elbow for Bracket—⅜, ½ inch Brass.
27. Elbow Dropscrew—⅜ inch Brass.
28. Tee—⅜, ½ x ⅜, ½, ⅝ x ½, ⅝, ¾ x ⅝, ¾ inch Brass.
29. Socket—⅜, ½, ⅝, ¾ inch Brass.
30. Elbow—⅜, ½, ⅝, ¾ Brass; ¼, ⅜, ½ inch for Iron pipe.
31. Straight Dropscrew—⅜, ½ inch Brass.
32. Elbow for Gallery—⅜, ½ x ⅜, ⅝ x ⅜, ¾ x ⅜ inch Brass.
33. Male and Female Elbow—⅜, ½ inch Brass.
34. Nose Piece—⅜, ½ inch Brass.
35. Union for Brass—⅜, ½, ⅝, ¾, 1, 1¼ inch Brass.

35A. Union for Brass, Male and Female—⅜, ½, ⅝, ¾ inch Brass.

36. Ceiling Plate—⅜, ½, ⅝, ¾, 1, 1¼, 1½, 2 Brass; ⅜, ½, ¾, 1, 1¼, 1½ inch for Iron pipe.
37. Barrel Union—¼, ⅜, 7/16, ½, ⅝, ¾ inch Brass; ¼, ⅜, ½, ¾, 1, 1¼, 1½, 2, 2½, 3 inch for Iron pipe.
38. Pillar Bottom—½, ⅝, ¾, 1, 1¼, 1½, 2 inch Brass.
39. Ball Joint with Ceiling Plate—⅜, ½, ⅝, ¾, 1, 1¼, 1½ Brass, ⅜, ½, ¾, 1, 1¼, 1½, 2 inch Iron.
40. Ball Joint—⅜, ½, ⅝, ¾, 1 inch Brass.
41. Compo. Union—¼, ⅜, ½, ⅝, ¾, 1 inch Brass.
42. Argand Burner—⅜ inch Brass.
43. Elbow with Gallery—⅜, ½, ⅝ inch Brass.
44. Gallery—⅜, 7/16, ½ inch Brass.
45. Gallery—⅜, ½ inch Brass.
46. Elbow with Gallery—⅜, ½, ⅝ inch Brass.
47. Gas Trident—⅜, ½ inch Brass.
48. Cap and Lining—¼, ⅜, ½, ¾, 1, 1¼, 1½, 2, 2½, 3 inch for Iron pipe.

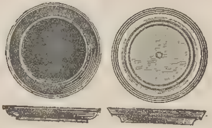


Fig. 510.

Gas Blocks.

We have always a large stock of Gas Blocks on hand, and can supply them in all colours, either plain or elaborately carved.

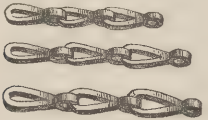


Fig. 511.

Brass Chandelier or Bath Chain.

This is a good, strong, and serviceable class of chain, and will be found useful for many more purposes than those above mentioned.

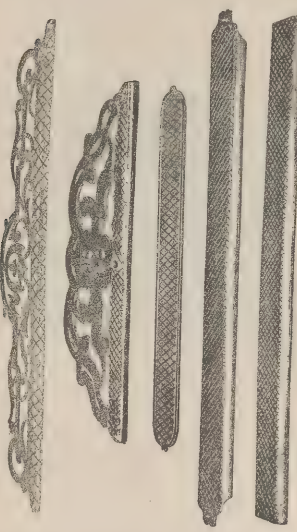
Pressure, Power, and Discharge of Gas.

The total heat of coal gas is 690 units per cubic foot, its evaporative power is 1 lb. of water from 62° per cubic foot of gas. The pressure of gas is measured in inches of water; the pressure at the gas works is from 2 to $2\frac{1}{2}$ inches of water, or a pressure of under 2 oz. per square inch. Gas weighs about 240 grains per cubic foot, or less than half the weight of air, which weighs about 560 grains per cubic foot. Gas has an ascending power equal to one inch of water for every 100 feet in height; it increases $\frac{1}{10}$ inch in pressure for every rise of 10 feet in height, and decreases at the same rate in pressure for a descent. Each gas-burner consumes 5 cubic feet per hour. (See Table, page 227.)

Fig. 512.

Electro-plating.

The above illustration will give our clients an idea as to the arrangement of our electro-plating room. We have devoted special attention to this branch of our business, and as a result are always kept busily employed. The number of old Tea and Coffee Services, Salvers, Spoons, &c. that we make almost equal to new during the year is incredible.



Brass Step Plates.

We make large numbers of Brass Step Plates for Public Offices, Theatres, Hotels, &c. They afford a firm footing, and at the same time prolong the life of the carpet, or plain or leaded stair tread.

Fig 513. Fig. 514 Fig. 515. Fig. 516. Fig 517

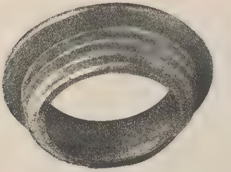


Fig. 518.

Brass Bung Holder.

It will at once be seen that the Brass Bung Holder is an improvement upon the old-fashioned bung hole which was always liable to be knocked out of shape, and was also in many cases responsible for a split stave which gave more than a little trouble. We supply a boring tool which bores the hole to the exact size required, and also a tool termed the gripper, which is inserted into the boring holder, and with the aid of a handle is capable of screwing the holder into its proper position. As will be seen from the illustration a coarse thread is cast on the outside of the bung holder which holds it in its proper position. We have supplied thousands of these to the different breweries in the Colonies, and invariably cast the name of the brewery and the address on the face of the flange.

AS A BILGE PUMP,

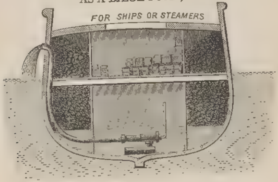


Fig. 519.

Steam Ejectors

(See pages 43 and 89).

Fig. 520.

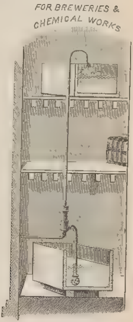


Fig. 521.

Steam Ejectors

(See pages 43 and 89).

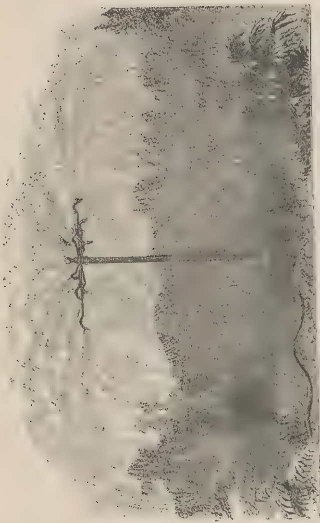


Fig. 522. Eight-armed Lawn Sprinkler Stand. For other Lawn Sprinklers see pp. 169 to 171.

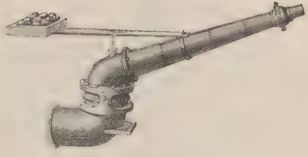


Fig. 523.

Little Giant Sluicing Nozzle.

We have supplied several of these to the different sluicing companies in operation in the Colonies. Their capabilities are well known, and wherever suitable water supply can be obtained, they form part of the cheapest and most reliable gold-getting plant that can be obtained.

Fig. 524.

Copper and Frame.

COPPERS & FRAMES.

10 Gallons	- £1	6	0
12 ,,	- 1	7	6
14 ,,	- 1	9	0
16 ,,	- 1	12	0
18 ,,	- 1	15	0
20 ,,	- 2	0	0
25 ,,	- 2	5	0
30 ,,	- 2	12	6

FRAMES.

10 Gallons	- £0	12	0
12 ,,	- 0	13	0
14 ,,	- 0	14	0
16 ,,	- 0	15	0
18 ,,	- 0	16	0
20 ,,	- 0	17	0
25 ,,	- 1	0	0
30 ,,	- 1	4	0

Copper Furnaces.

Gallons.	Top.	Bottom	Deep	Lag to Bottom	Weight	Gallons	Top.	Bottom.	Deep	Lag to Bottom.	Weight
10	18	14	13	21	15 lbs.	78	36	29	26	41	119 lbs.
12	19	15	14	22	18	86	37	30	26	42	129
14	20	16	15	23	20	93	38	31	27	44	139
16	21	17	15	24	24	100	39	31	28	45	150
18	22	18	16	25	27	105	40	32	29	46	159
20	23	19	17	26	31	111	41	33	29	47	166
23	24	19	17	27	35	121	42	34	30	48	181
26	25	20	18	29	40	132	43	35	31	49	196
30	26	21	19	30	45	143	44	36	32	50	216
33	27	22	19	31	50	155	45	37	33	51	232
37	28	23	20	32	55	166	46	38	34	52	249
41	29	24	21	33	60	177	47	39	35	53	260
45	30	25	21	34	68	185	48	40	36	54	276
50	31	26	22	36	75	197	49	41	36	55	296
55	32	26	23	37	82	212	50	42	37	56	318
65	33	27	24	38	90	227	51	43	37	57	340
72	35	28	25	40	108	240	52	44	38	58	366

We make a speciality of Copper Furnaces, and the above table will give our clients an idea of the size and weight of a boiler of any capacity they may require.

We manufacture these to special designs, and, in fact, undertake copper work of any kind whatever.

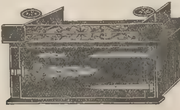


Fig. 525.

BEST OVENS—With Fall Bar and Trivets.

	BRIGHT.	BLACK.		BRIGHT.	BLACK.
No. 0	60/-	56/-	No. 5½	39/6	38/-
„ 1	56/-	52/-	„ 5	37/6	35/3
„ 2	52/-	48/-	„ 6	36/6	34/6
„ 3½	48/-	45/-	„ 7	32/6	31/-
„ 3	45/-	42/-	„ 8	28/6	27/-
„ 4	41/-	38/6			

COMMON OVENS—With Fall Bar and Trivets.

	BRIGHT.	BLACK.		BRIGHT.	BLACK.
No. 0	34/6	33/-	No. 3	29/-	27/6
„ 1	32/6	31/-	„ 4	27/-	25/6
„ 2½	32/-	30/6	„ 5	26/-	24/6
„ 2	31/-	29/6	„ 6	22/6	21/-

With Angle Iron Flanges on Body—36 in. Ovens, 6/- extra; 30 in., 5/- extra; 24 in., 4/- extra. Oven Flues, 1/- per pair extra.

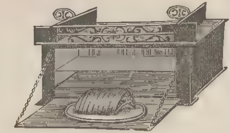


Fig. 526.

BEST COLONIAL OVENS—With Fall Door, Bar and Trivets.

	Bright.	Black.		Bright.	Black.
No. 0	64/6	60/6	No. 5½	44/-	42/6
„ 1	60/6	56/6	„ 5	42/-	39/9
„ 2	56/6	52/6	„ 6	41/-	39/-
„ 3½	52/6	49/6	„ 7	37/-	35/6
„ 3	49/6	46/6	„ 8	33/-	31/6
„ 4	45/6	43/-			

COMMON COLONIAL OVENS—With Fall Door, Bar and Trivets.

	Bright.	Black.		Bright.	Black.
No. 0	39/-	37/6	No. 3	33/6	32/-
„ 1	37/-	35/6	„ 4	31/6	30/-
„ 2½	36/6	35/-	„ 5	30/6	29/-
2	35/6	34/-	„ 6	27/-	25/6

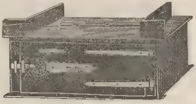


Fig. 527.

BEST OVENS—With Hobs.

	Bright.	Black.		Bright.	Black.
No. 0	54/6	50/6	No. 5½	34/6	33/-
„ 1	50/6	46/6	„ 5	32/6	30/3
„ 2	46/6	42/6	„ 6	31/6	29/6
„ 3½	42/6	39/6	„ 7	27/6	26/-
„ 3	39/6	36/6	„ 8	24/-	22/6
„ 4	35/6	33/-			

COMMON OVENS—With Hobs.

	Bright.	Black.		Bright.	Black.
No. 0	29/-	27/6	No. 3	24/-	22/6
„ 1	27/-	25/6	„ 4	22/-	20/6
„ 2½	27/-	25/6	„ 5	21/-	19/6
„ 2	26/-	24/6	„ 6	18/-	16/6

With Angle Iron Flanges on Body—36in. Ovens, 6/- extra; 30in., 5/- extra; 24in., 4/- extra. Oven Flues, 1/- per pair extra.

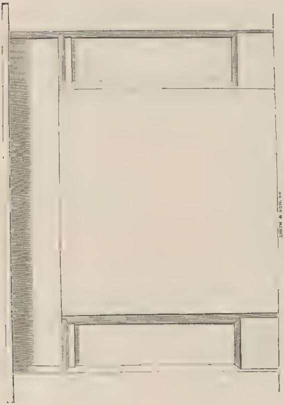


Fig. 528.

We supply this Mantelpiece in enamelled wood, Sicilian or Rouge marble.
A very good bedroom mantel.

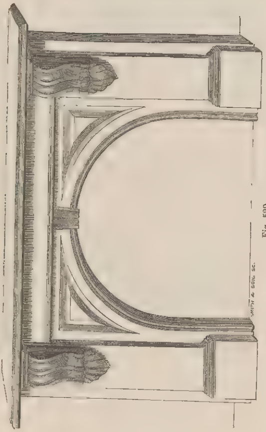


Fig. 529.

Made in Sicilian or St. Ann's marble. **A very effective mantel.**

We stock very much more expensive mantels than these shown, but at present have no illustrations

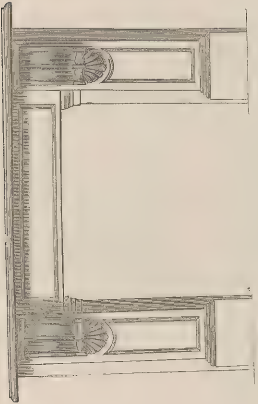


Fig. 530.

Sicilian or St. Ann's Mantel.

Made with double shelf and quarter columns when required.

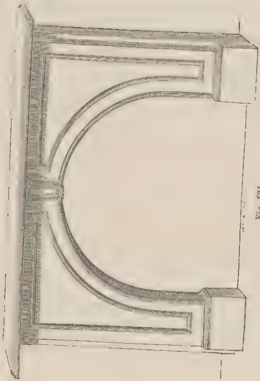


Fig. 531.

Sicilian or St. Ann's Mantel.

Made with double shelf and quarter columns as when required.

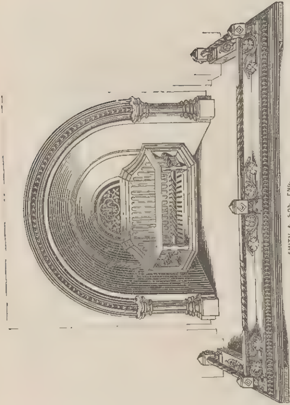


Fig. 532.

Register Grates and Fenders.

We make a specialty of Fenders, and stock them largely in Brass, Iron, and Marble. We take a great pride in our show-rooms, and have always a good stock on hand.

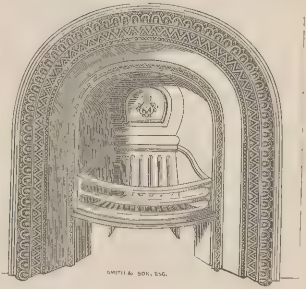


Fig. 533.

Register Grate.

We stock all patterns of Grates, both Tiled and Plain; we have always a very large assortment on hand, and our show-rooms are well worth a visit.


ENGINEER
J. DANKS & SON
BRASS FOUN

FIRST PRIZES.

We have been Awarded First Prizes at

PARIS	CALCUTTA	ADELAIDE
PHILADELPHIA	MELBOURNE	CHRISTCHURCH
AMSTERDAM	SYDNEY	LAUNCESTON

We strive to make a good reliable article, and the above awards should be a fair criterion as to the success of our efforts.

INDEX.

Sands & McDougall, Limited, Printers, Melbourne